American Machinist

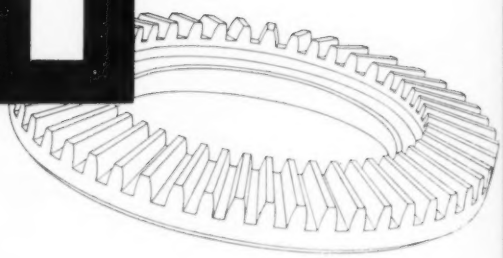
McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

MARCH 5, 1951

Yesterday's sleight-of-hand craft (see page 2) has grown into modern...

Thread Chasing—A SPECIAL REPORT

new Heald internal outproduces older equipment by nearly 2 to 1



One new Heald Internal precision grinds almost as many ring gears as two older type machines

This might be just another case history, except for one thing — a production increase of almost 100 per cent. And that's a pretty important saving in any production man's language.

A new Heald Model 271 Gage-Matic was installed by an automotive manufacturer for grinding the bore of differential ring gears. A simple, straightforward operation — yet it was found that the new machine out-produced the older ones by almost two-to-one! Why? Because all of the new Heald machines have been designed to save time and effort on *every phase* of the operating cycle. It all adds up to a substantial increase in production efficiency.

Remember — when it comes to precision finishing, it pays to come to Heald.

The new Heald Model 271 Gage-Matic grinds ring gear bores nearly as fast as two older machines.

THE HEALD MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION

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AMERICAN MACHINIST, published bi-weekly by McGraw-Hill Publishing Company, Inc., James H. McGraw (1860-1948), Founder.

EXECUTIVE, EDITORIAL, ADVERTISING AND PUBLISHING OFFICES: McGraw-Hill Building, 330 West 42nd Street, New York 18, N.Y. Curtis W. McGraw, President; Willard Chevalier, Executive Vice President; Joseph A. Gerardi, Vice President, Treasurer; John J. Cooke, Secretary; Paul Montgomery, Senior Vice President, Publications Division; Ralph B. Smith, Editorial Director; Nelson Bond, Vice President, Director of Advertising; J. E. Blackburn Jr., Vice President, Director of Circulation.

SUBSCRIPTIONS: Address correspondence to American Machinist-Subscription Service, 330 West 42nd Street, New York 18, N. Y. Allow ten days for change of address. Please indicate position and company connection on all subscription orders.

Single copies, 50c. Subscription Rates—United States and possessions, $5 a year, $8 for two years, $10 for three years. Canada $7 for one year, $11 for two years, $14 for three years. Pan-American countries, $10 for one year, $16 for two years, $20 for three years. All other countries, $20 for one year, $36 for two years, $48 for three years. Entered as second-class matter, August 13, 1943, at Post Office, New York, N.Y., under the act of March 3, 1879. Printed in U.S.A.

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Chips and QUIPS

Hand Chasing . . . Fred Colvin's description of how threads were cut on a lathe during his apprenticeship 60 years ago was the inspiration for our current cover. It shows hand chasing, with a tool not unlike a file with teeth cut in the end. The operator had to be very skilled, because only a smooth, even, first pass could avoid a drunken thread. The usual starting trick was to pivot the tool on the left hand, which was against the tool rest, by swinging the right hand to the right in an even sweep. Then the chaser was fed across, providing its own lead. Subsequent passes were easy—assuming the tool didn't dig.

Executive Editor Tangerman whittled the method in thick white pine—a low-relief carving that provides a real exercise in distortion to make the perspective look right. It is simply tinted with oil pigments. The background was cut away (making the piece a "pierced" carving) for the same reason a photographer blanks out the background in a shop photo—it contributed nothing and might have detracted somewhat from the subject. Fat men please note the "tall, thin" effect of the vertical lines in the background.

Machine-Tool Checking . . . Ford engineers have added a new wrinkle to acceptance tests for high-production machine tools. They enter the vendor's plant with vibration-analysis equipment to check potential sources of chatter or lack of size control. Also, they study the machine and fixtures in respect to any factor that might cause production troubles—chip pileups, tool materials not up to specs, and most important, any aspect of work clamping or machine-cycle control that interferes with the operator. Rupert Le Grand explains.

"Must" Reading . . . Don't miss the panel discussion on carbides in dies. Starts on page 172 and is full of hot data.

Thread Chasing . . . Our current Special Report is the first of four which we must confess were stimulated by the cover carving. Assistant Editor Stocker has chosen Thread Chasing as his current subject, to be followed April 2 by Tapping, each a 16-page compendium of basic and latest information, contributed to by many producers and users.

Redesign With Change . . . Gray Mfg. Co. builds the Audograph, a dictating machine. It should have constant identity—so production changes must be made without major visible changes. Gray complied with both requirements and cut costs on the machine 45% while increasing production and quality.

Statistic . . . Our indexer, who has now completed our 1950 index for *AM*, reports 916 articles last year, as compared with 1019 in '49 and 887 in '48. Indexes are available, if you want one.

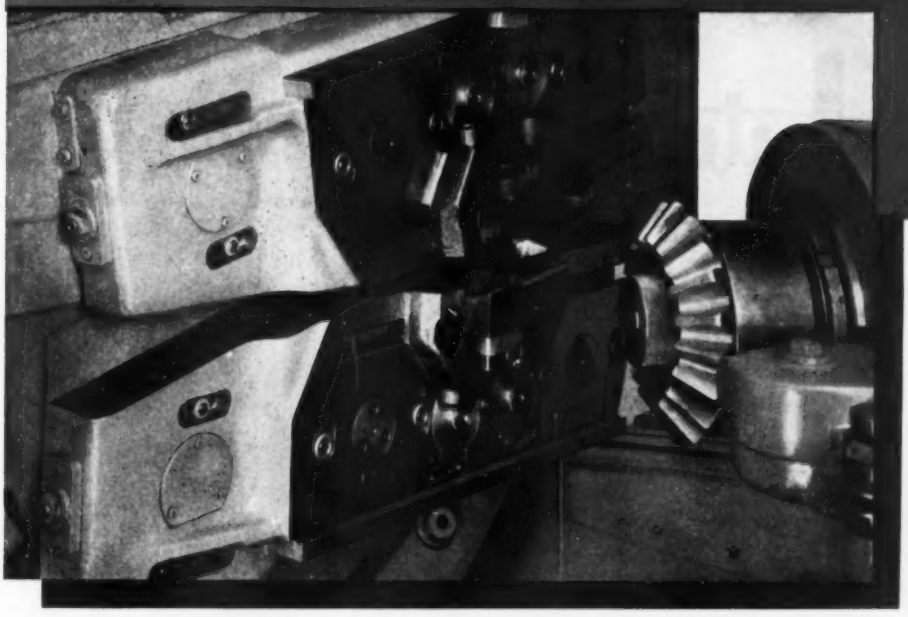
Choosy Carburizing . . . Our current instalment, the ninth, of T. A. Frischman's series on carburizing takes up two important factors, one the depth of case, the other selective carburizing. Depth and type of case, and carburizing only the proper areas, are problems every carburizer faces. Here are an expert's answers.

Thinking Apprentices . . . International Business Machines Corp. has extensive employee-training plans, including liberal-arts courses and an unusual toolmaker-apprentice setup. We describe it in this issue and show the curriculum. It is impressive for two reasons right now: 1. Graduates make good and work up. 2. It takes only a bit over three years.

Coming . . . March 19 *AM* will include a Special Report on spinning metals, a description of gears that print, use of multi-thread hobs at Chevrolet-Muncie, a microtelescope for aligning diesel bearings, more on carburizing, and several other features including one of our popular Talented Tooling spreads.

B & S MAN . . . J. M. Finally was born in Providence, R.I., and served his apprenticeship at Brown & Sharpe. He attended R.I. School of Design for three years, then went out to Detroit. He was a toolmaker for Chrysler for a short time, then moved on to Chevrolet-Flint, division of GM, becoming toolroom foreman in 1926. In 1937, he moved to Chevrolet-Tonawanda as toolroom foreman, later becoming tool supt and asst master mechanic in turn. In 1946, he returned to Detroit as asst master mechanic of the Chevrolet Light Car Division, moving a year later to Chevrolet-Muncie, first as asst master mechanic, then as master mechanic. He authored our story last issue on high-speed turning, goes on Mar. 19 to describe multi-thread hobbing, as both are done at Muncie.

CONIFLEX* GEARS HAVE LOCALIZED TOOTH BEARING



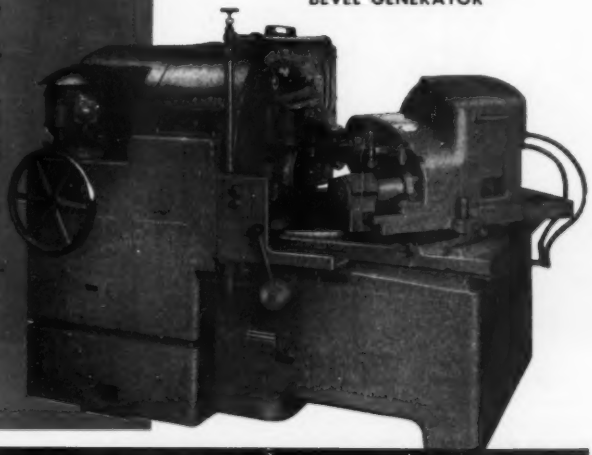
The "built-in" feature of localized tooth bearing on Coniflex gears is easily set through simple dial adjustments only on the face of the tool slides.

Coniflex gears are superior to ordinary straight bevels:

- In assembly, for they have wider tolerances for positioning.
- In operation, for they are built to provide even distribution of the load along the tooth surfaces without dangerous concentration at the ends of the tooth.

This "built-in" feature on the gear tooth can be obtained only on Coniflex gears cut on Gleason machines such as the Gleason No. 14 Straight Bevel Generator.

GLEASON No. 14 STRAIGHT BEVEL GENERATOR

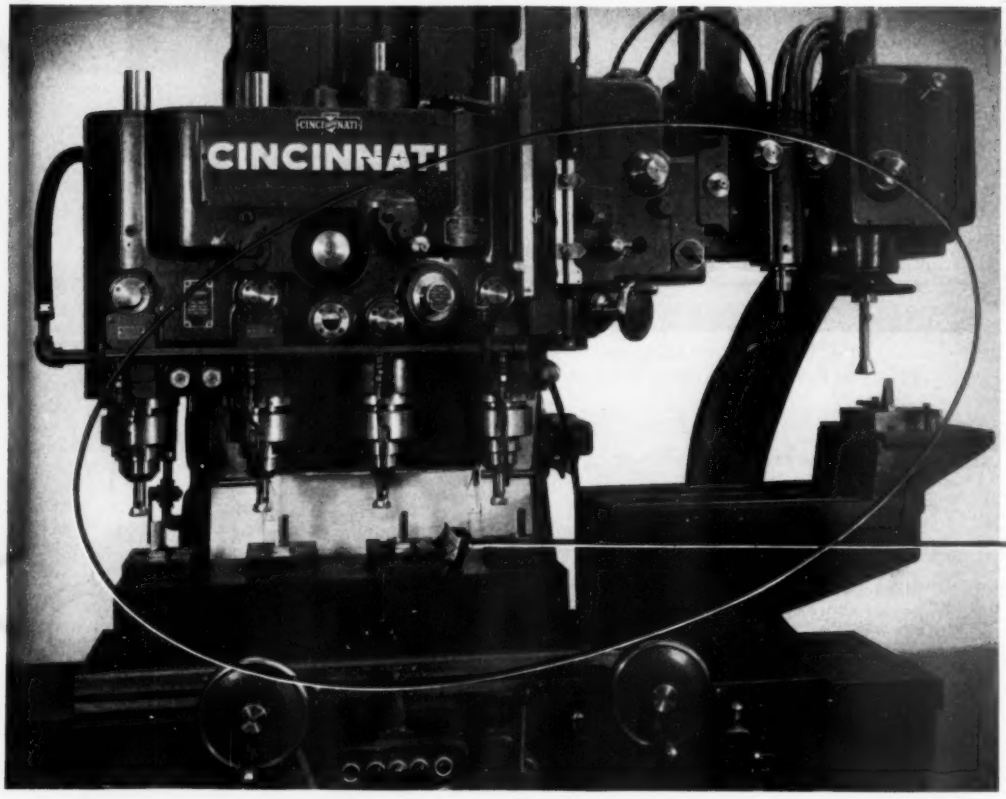


GLEASON Works
1000 University Avenue
Rochester 3, N. Y., U. S. A.

Builders of Bevel Gear Machinery for Over 85 Years

Cincinnati Hydro-Tel

Automatically profile



CINCINNATI 16" Vertical Hydro-Tel Milling Machine, completely equipped by Cincinnati Application Engineers for various milling operations on short stainless steel turbine blades and buckets. In the setup shown here, the parts are profile milled in one continuous cut. Longer turbine blades and buckets are mounted horizontally, supported on both ends, and automatically profile milled on the same machine with the aid of the Hydraulic Automatic Depth Control Unit.

CINCIN

MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES

mills intricate shapes...

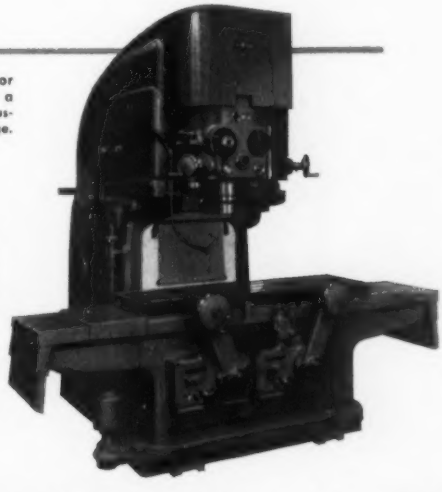
...four at a time

How would you like to divide the cutting time of a "slowpoke" operation by 4? The CINCINNATI 16" Vertical Hydro-Tel illustrated here does it by milling four parts at one time. Even greater timesaving is gained through Hydro-Tel's 360° Automatic Profile Milling Unit . . . the intricate shape of short turbine blades and buckets is automatically milled in one continuous cut, from the top to the bottom of the part. As the tracing finger scans the master, the four-spindle cutting head accurately follows the same path while slowly feeding down. The operator simply loads and unloads the fixtures, and then the machine takes over, automatically milling four parts at one time. ¶ This Hydro-Tel has other features for additional work . . . Hydraulic Automatic Depth Control Unit and Automatic Feed Cycle with pick feed to table. The many advantages of CINCINNATI 16" Vertical Hydro-Tel Milling Machines, both standard and extras, offer exceptionally high timesaving opportunities for your retooling programs. An attractive catalog, No. M-1497-1, gives you complete information. Brief specifications in Sweet's Catalog File.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

Photo of turbine blade or bucket being milled 4 at a time on the equipment illustrated on the opposite page.

Complete specifications on the CINCINNATI 16" Vertical Hydro-Tel may be obtained by writing for catalog No. M-1497-1. For brief details look in Sweet's Catalog File for Mechanical Industries.

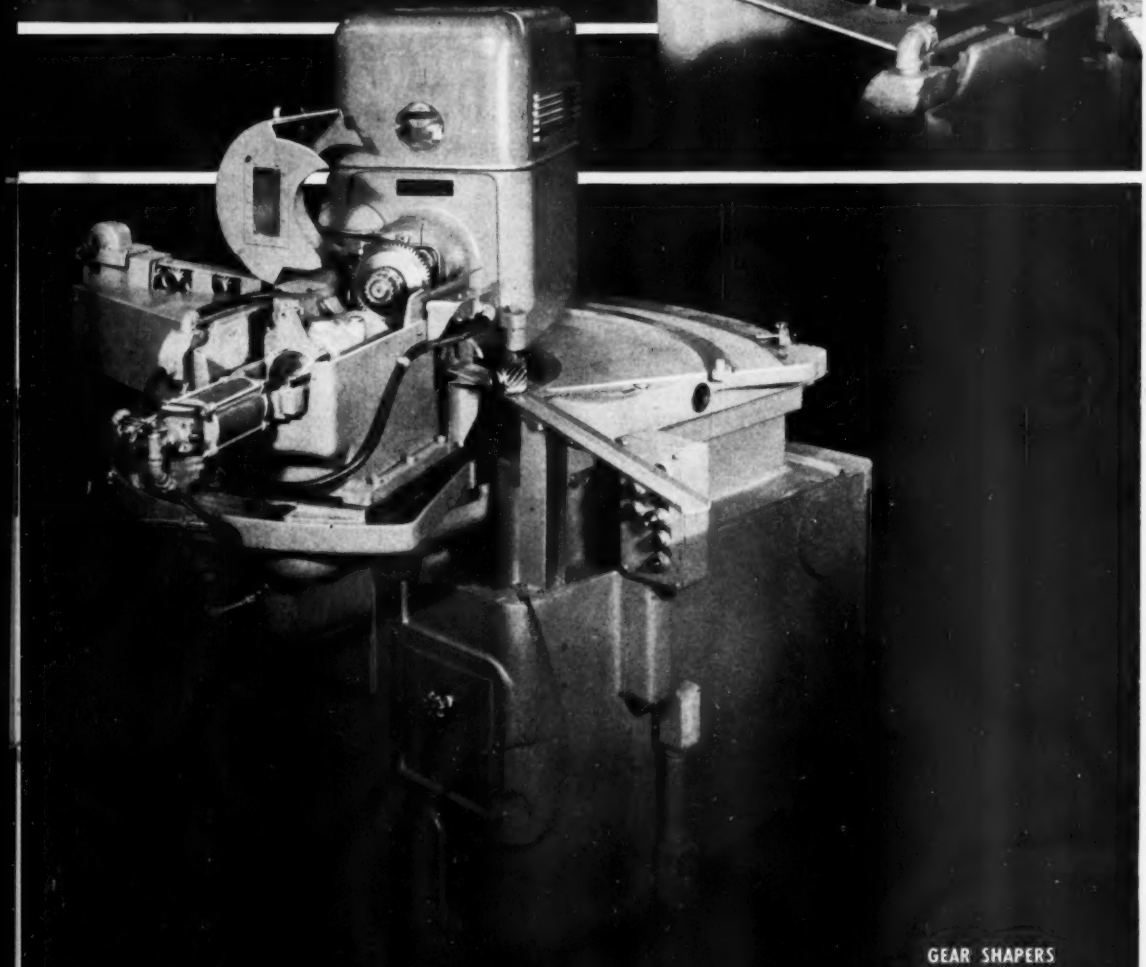


NATI

CINCINNATI

FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

'Full Tool' Shaving...



GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS

PLASTICS MOLDING MACHINES

still *faster* with Automatic loading and unloading

Magazine Feed Still Further Reduces the Operating Effort Required

Fellows 'Full Tool' Shaving is essentially an extremely high speed operation. ' ' ' The shaving time per gear or pinion can be so short that loading becomes an important time-economy factor. ' ' ' Hence Fellows optional addition of magazine type Automatic Loading and Unloading! ' ' ' The air-actuated work positioning, clamping and ejection are split-second timed into the automatic cycling of the machine. ' ' ' The resulting overall speed sets new standards—from which our engineers will be glad to quote rates on specific gears and pinions. ' ' ' For data, call on the nearest Fellows office.

Fellows

THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department • 78 River Street, Springfield, Vermont
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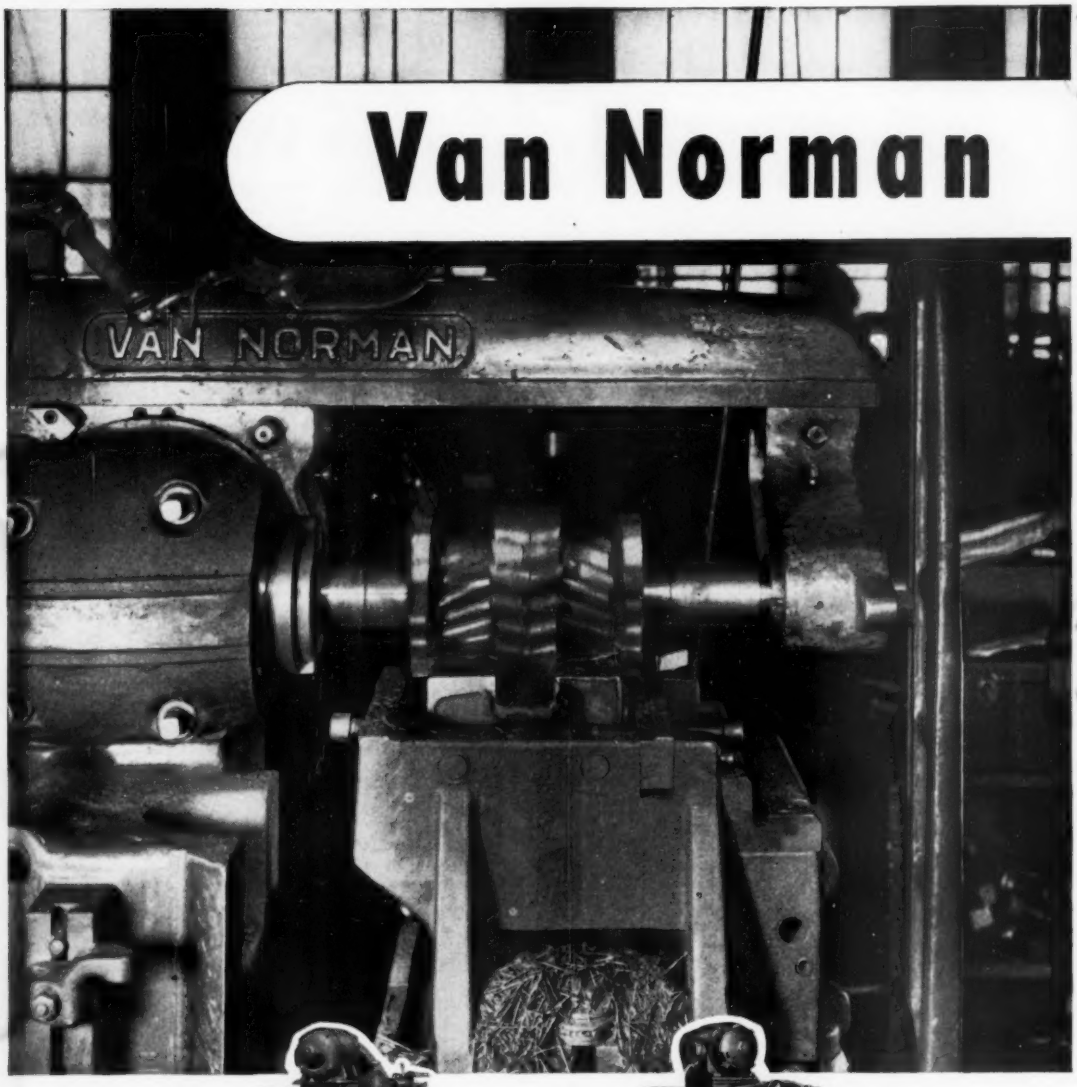
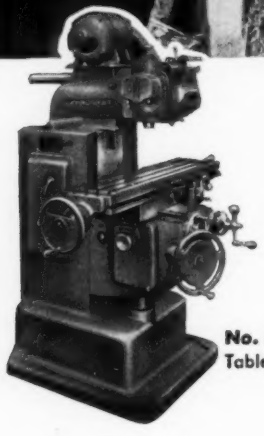
Van Norman





No. 16
Table: 37" x 9½"

No. 22L
Table: 45" x 10"

Ram Type Millers

Increase Productivity Wherever They Are Used

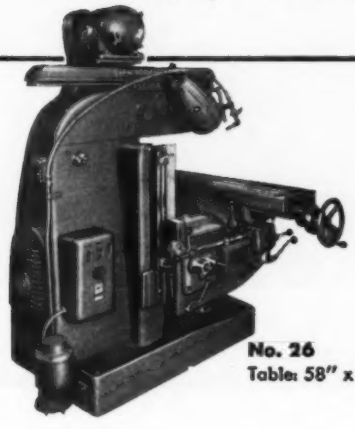
Whether it be in the toolroom, production department, machine shop or laboratory, Van Norman Ram Type Millers increase milling output and cut cost.

Here's how these versatile milling machines enable you to perform horizontal, vertical and angular milling on *one* machine. Simply position the adjustable cutterhead in the required position, lock and you are ready to proceed with the work. They minimize down time for work reset-ups because most jobs can be carried through to completion in the original set-up. In addition, the adjustable cutterhead in combination with the moveable ram and saddle cross feed increases the work range of these millers. Ease of operation is assured with the conveniently grouped operating controls, large easy-to-read dials and quick change speed and feed selectors.

Van Norman Ram Type Millers are available in a wide range of sizes with plain and universal saddles to meet practically all milling requirements. Write for information.

VAN NORMAN COMPANY
SPRINGFIELD 7, MASSACHUSETTS

"It pays to Van Normanize"



No. 26
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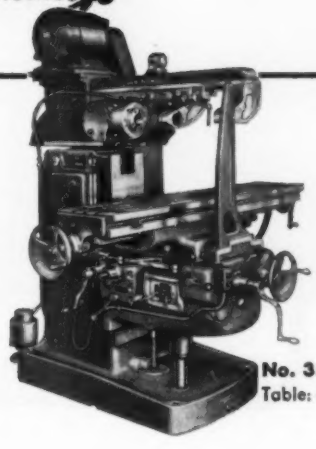
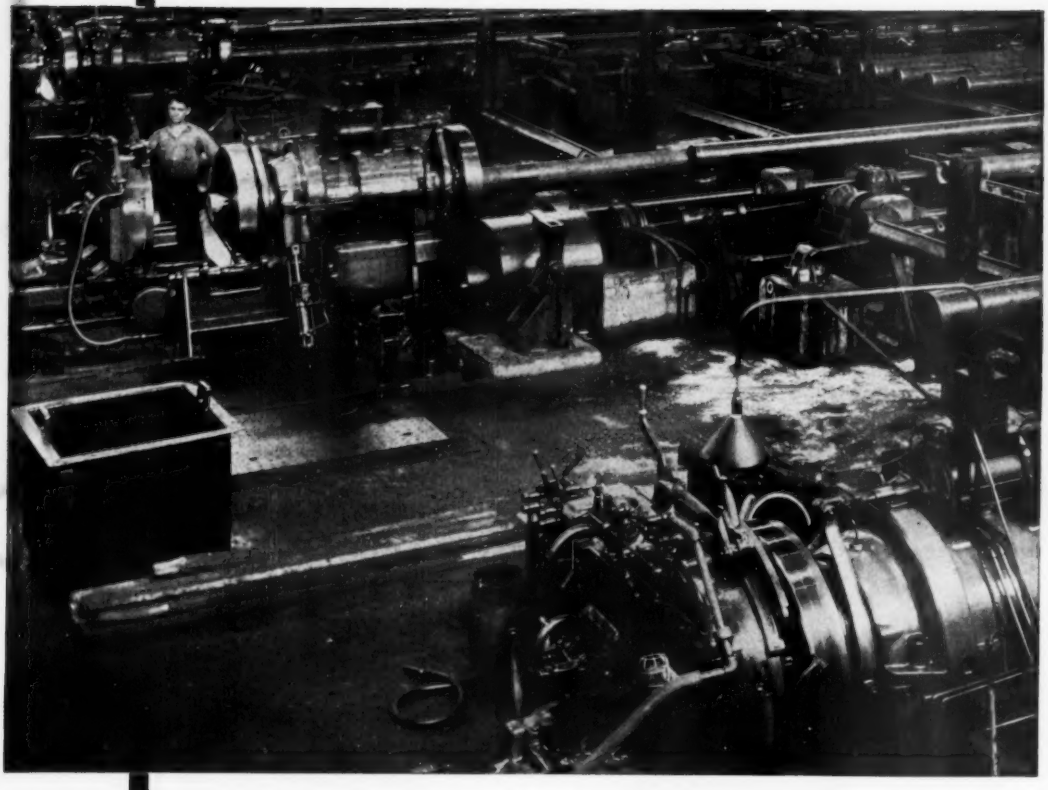


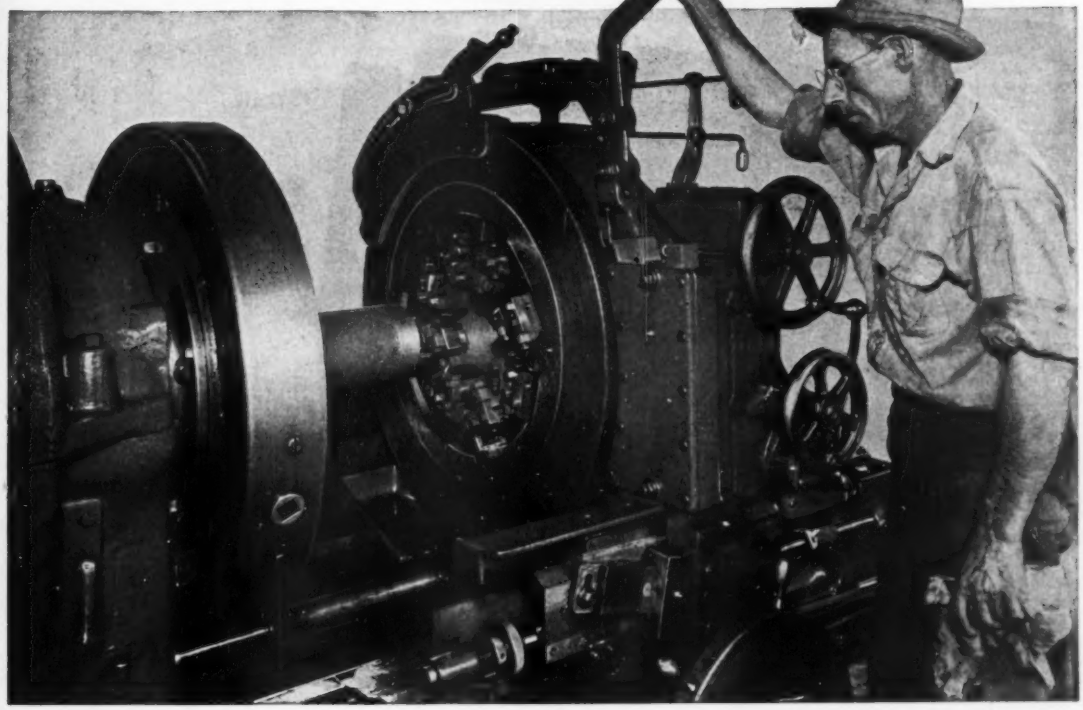
No. 38
Table: 64" x 14"

SAVE 5 WAYS ON

- ✓ Fewer Machines
- ✓ Lower Tool Cost
- ✓ Lower Tool Inventory
- ✓ Less Set-up Time
- ✓ Higher Production



PIPE THREADS...



In tightening markets, Landis Pipe Threading Machines offer wide-open opportunities to cut production costs of pipe threads.

Three sizes of Pipe Machines will handle all diameters of pipe from 1/4" to 18". Each die head is constructed to handle a wide range of pipe sizes—for example the 6" machine will thread all diameters from 1" to 6". Universal size adjustment allows quick set-up. Thus, a few machines will handle the complete range.

Die heads employ Landis Tangential Pipe Chasers. Interchangeability of the chasers further increases the versatility of these machines. The same chasers may be used for all diameters of threads within the range of a given die head providing that the pitch, form, and taper remain the same, thus reducing tool inventory. Chasers need be replaced only one at a time as needed. Chasers last longer since 80% of their length may be reground as the cutting edge dulls. Line contact with the work reduces friction and chaser wear, allows use of higher cutting speeds, and reduces chaser breakage.

A separate type of machine, the Receding Chaser Pipe Machine, is especially designed to handle A.P.I. Tapered Pipe Threads. Chasers recede into the head at a rate equal to the taper of the thread, ensuring accurate and uniform taper along the full thread length. This mechanism allows the use of smaller chasers, lowering tool cost and dollar tool inventories. Leave-off marks are eliminated by this receding action.

Investigate how Landis Pipe Machines can reduce direct tool cost, increase daily production, and reduce investment in tool inventory and heavy machinery. Write for specifications and further information.

LANDIS Machine COMPANY

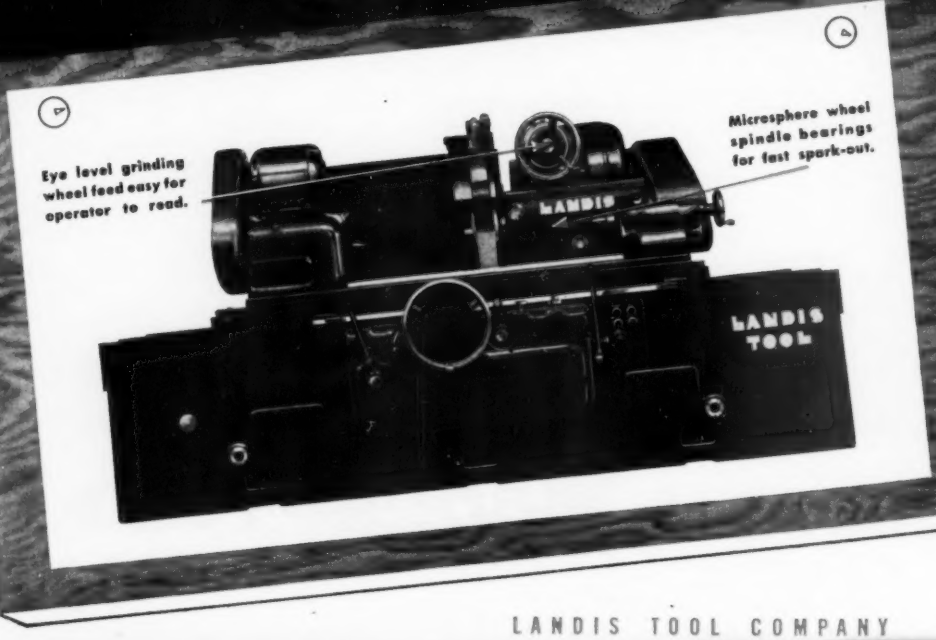
WAYNESBORO • PENNSYLVANIA • U. S. A.

NEW LANDIS TOOL grinder

10" - 14" Type CH Plain

Grinding wheel spindle with 150% sectional area between bearings permits heavier cuts.
Telescoping way covers protect hand scraped ways.
Centralized simple operating controls reduce operator fatigue.

Newest Design to

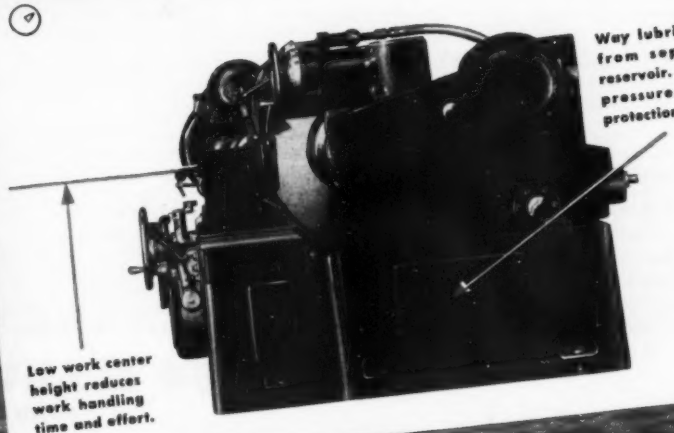

Eye level grinding wheel feed easy for operator to read.
Microsphere wheel spindle bearings for fast spark-out.
LANDIS
LANDIS TOOL

LANDIS TOOL COMPANY

memo / from engineering dept.

Here are features of the new 10"-14" CH Plain Cylindrical Grinder that mean lower precision grinding costs.

Reduce Grinding Costs



Way lubrication from separate reservoir. Safety pressure switch protection.

Low work center height reduces work handling time and effort.

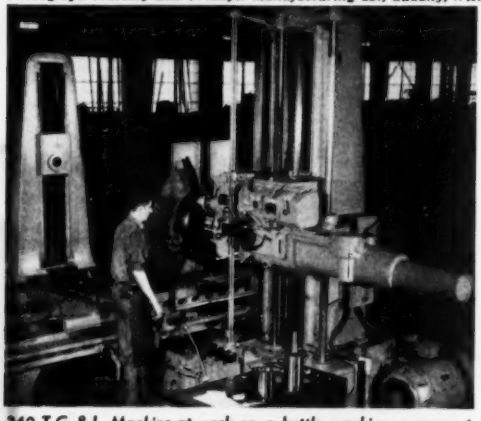
For specifications and full details, write for new 22-page Catalog B-50.

LANDIS TOOL
Precision Grinders

WAYNESBORO, PENNA., U.S.A.

NEW SINGLE SPINDLE HIGH SPEED

Photograph courtesy Geo. J. Meyer Manufacturing Co., Cudahy, Wis.



340-T G. & L. Machine at work on a bottle machine component. Metal is removed faster than sawing, the method formerly used.

provides faster metal removal and closer speed selection

45 Speeds from 10 to 1300 rpm in Fine Progression Offer Operator Wide Choice Without Compromise . . . Permit Maximum Efficiency When Using Carbide and Cast Alloy Tipped Tools

Six entirely new features—combined with added designed improvements—permit taking full advantage of carbide and cast alloy tooling on the new single spindle, *High Speed* G. & L. Machine. In addition, the working range of this machine makes it highly adapted for all types of light, medium and heavy-duty machining where carbides are not required.

Improved Performance and Broader Capacity Obtained Through These New Structural Features:

1 **Hardened Ways on Bed and Saddle**—Heavy-duty, surface hardened ways maintain high machining accuracy over longer periods of time.

2 **Single Spindle**—This nitralloy steel spindle rotates from 10 to 1300 rpm. Speed changes are in fine geometric progression, permitting the operator to select the proper speed for the job.

3 **Automatic Positioning Device**—This unit reduces and often eliminates the need for special jigs and fixtures and minimizes operator responsibility for maintaining accuracy.

4 **Swiveling Pendant Control**—This control box is swung in a semi-circle to any position. Fingertip control enables the machine operator to watch work closely and with safety.

5 **Rapid Speed Change**—The operator may easily select any of the 45 spindle speeds without the necessity of reading a complicated chart.

6 **Hardened, Accurate Gears**—Machine gears are cut and shaved, then flame hardened. Accuracy and precision of gear train assemblies insures unusually quiet operation at high speeds.

plus
- **Centralized Operation**
- **Directional Control Levers**
- **Simplified Maintenance**
- **Increased Working Range**—with higher column, longer beds, table and saddles.

This G. & L. Machine has the capacity to handle all jobs within its range with ample margin of reserve capacity for occasional work of an unusual nature and size. Pace setting design of the new, single spindle, *High Speed* G. & L. Machine may easily solve your stubborn production problems. Ask experienced G. & L. engineers to recommend machining practices that will help you now. ***Write for New Bulletin 34-T.***

GIDDINGS & LEWIS
FOND DU LAC

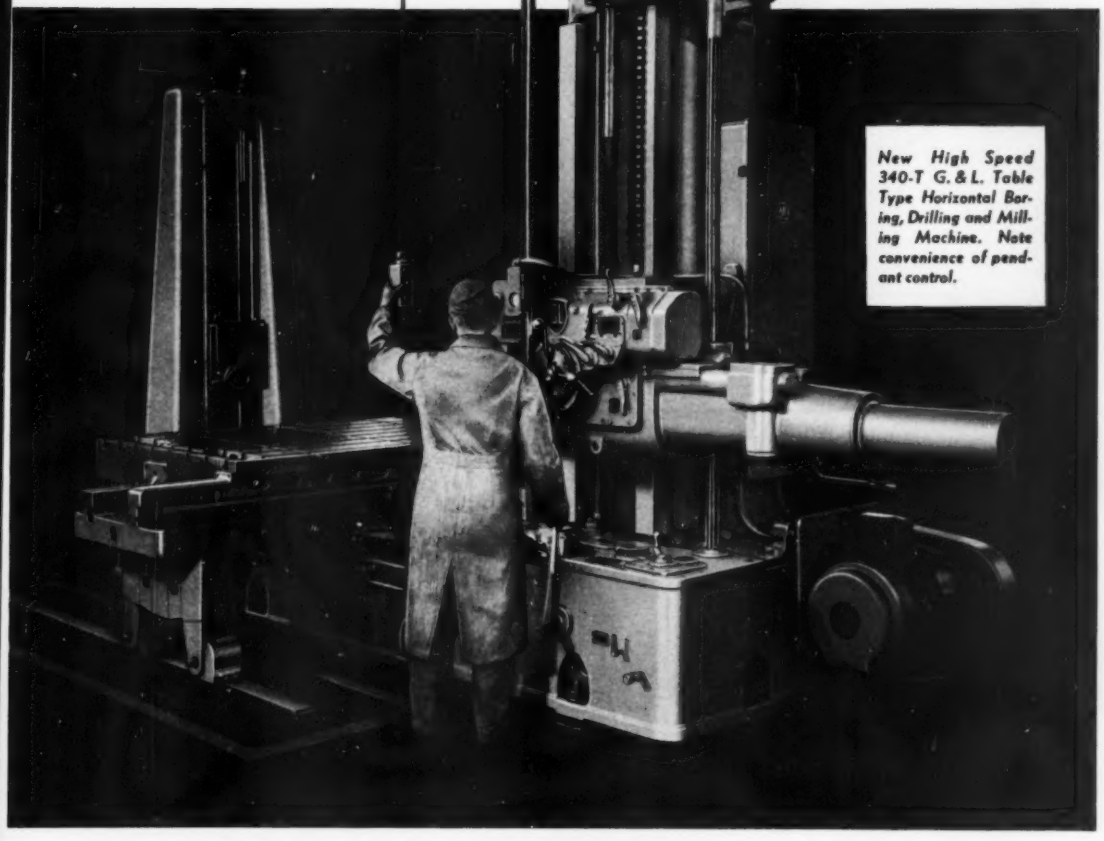
G&L HYPRO

G. & L. Table Type Horizontal Boring Machine

G. & L. Floor Type Horizontal Boring Machine

G. & L. Planer Type Horizontal Boring Machine

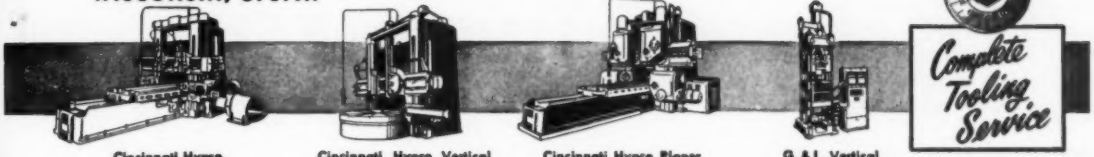
G&L MACHINE



New High Speed 340-T G. & L. Table Type Horizontal Boring, Drilling and Milling Machine. Note convenience of pendant control.

MACHINE TOOL COMPANY

WISCONSIN, U. S. A.



Cincinnati Hypro Double Housing Planer

Cincinnati Hypro Vertical Boring and Turning Mill

Cincinnati Hypro Planer Type Milling Machine

G. & L. Vertical Plastics Injection Press

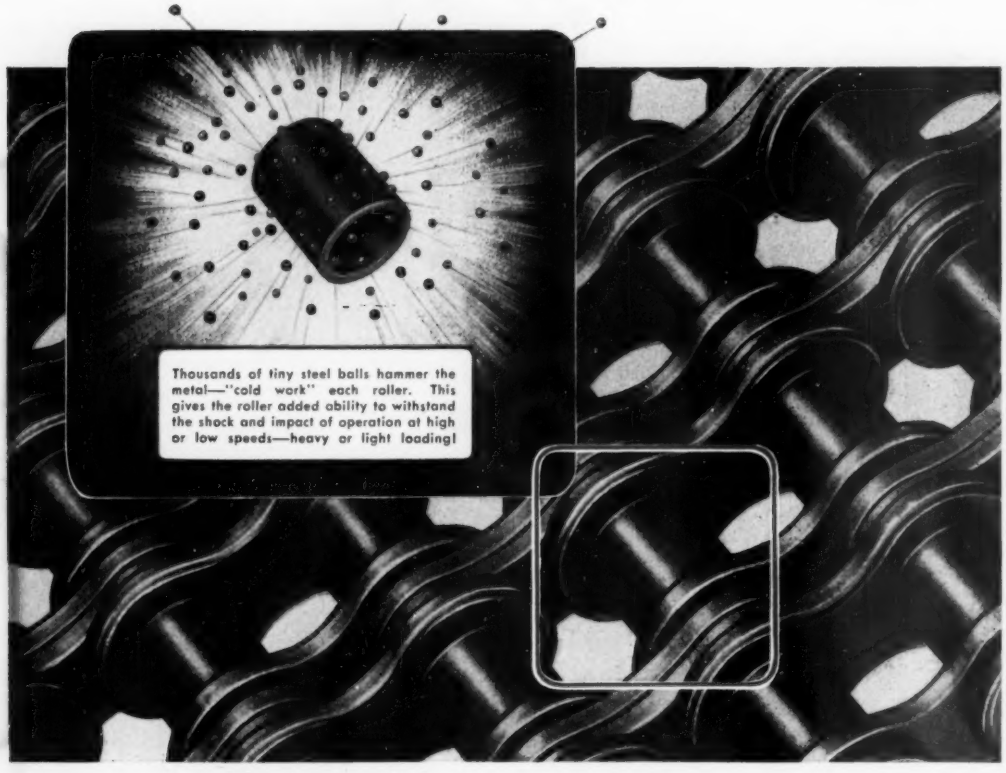
DAVIS

Complete Tooling Service

Get the roller chain with rollers that are

SHOT PEENED

for EXTRA fatigue life!


Thousands of tiny steel balls hammer the metal—"cold work" each roller. This gives the roller added ability to withstand the shock and impact of operation at high or low speeds—heavy or light loading!

You get this added feature in every LINK-BELT Roller Chain

You get absolute uniformity, too. No highs. No lows. Just smooth, flowing dependable chains that pay off in wide flexibility—greater performance—longer life.

You see, LINK-BELT Roller Chains are made from carefully selected materials with controlled heat treatment to assure uniformity and absence of weak members, then—rollers are shot peened to give them the extra fatigue life needed for today's higher speeds and heavier loads.

Link-Belt Roller Chain is available in single or multiple widths, in ⅜" to 3" pitch and double pitch. If you have a roller chain problem, see the LINK-BELT engineer nearest you.

LINK-BELT

ROLLER CHAINS and SPROCKETS

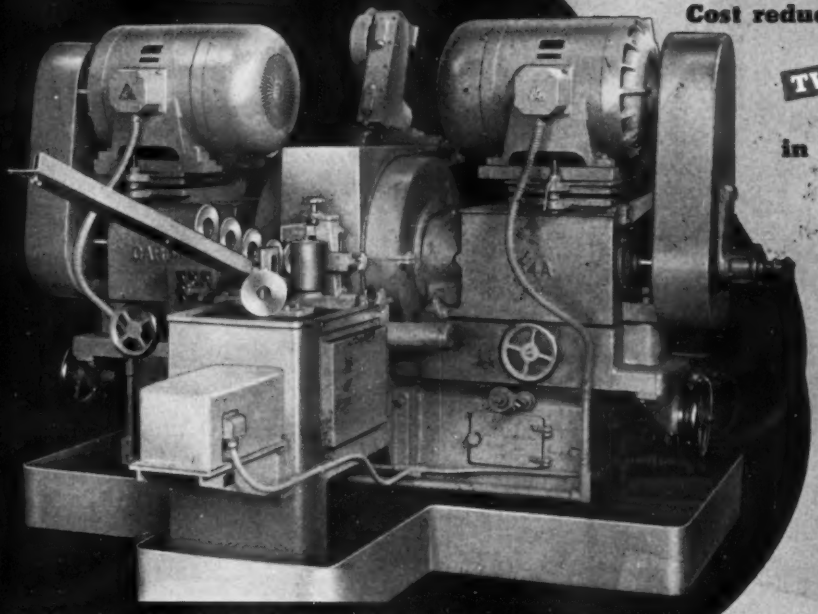
LINK-BELT COMPANY, Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Johannesburg. Offices, Factory Branch Stores and Distributors in principal cities. 12,207

GARDNER

precision disc Grinders

Grinds Parallel Faces of 15 Discs Per Minute

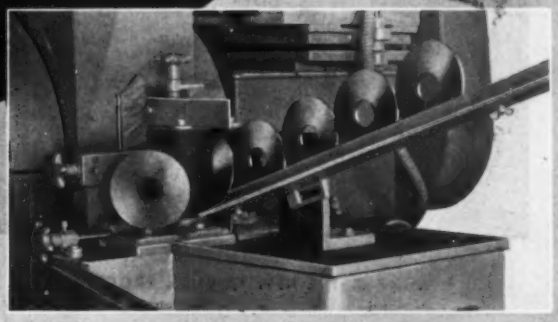
Cost reduced by grinding TWO surfaces in ONE operation



Grinding hardened clutch wear plates. 15 pieces per minute. .010" stock removal per cut 5.125" O. D. .188" thick. Limits .002" — .003" flatness, parallelism and uniformity. Gardner Double Disc Precision Grinder 84B-30".

107 M

Request Bulletin No. 12-7.



Gravity feed to power operated adjustable roll feed-thru fixture.

GARDNER MACHINE COMPANY

410 East Gardner Street • Beloit, Wisconsin, U.S.A.

WHAT IS THE NEW NORTON PROCESS?
Developed and installed by Norton engineers in a new 5-acre plant, it is a streamlined, precision process that produces grinding wheels to a degree of uniformity never before thought possible. The process involves production equipment and quality control methods that assure the uniformity of all mixing, molding, firing, and finishing operations. The result: uniform structure, inherent balance and grinding efficiency unmatched in the entire abrasive field.

YOUR TOOLROOM GRINDING COSTS

with the most uniform wheels ever produced!

Only Norton *New-Process* Wheels Give You All 3 Advantages

1. BUILT-IN BALANCE reduces vibration in operation. The wheel hugs the work. You can grind to closer tolerances and smoother finishes. No more chatter marks! What's more, this balance is inherent. It stays for the life of each wheel.

2. MORE UNIFORM STRUCTURE means consistent grinding action throughout each wheel and from wheel to wheel . . . more even wear for longer life . . . fewer machine adjustments . . . less risk of tool spoilage . . . assurance that all wheels with identical markings will give you the same top-grade performance.

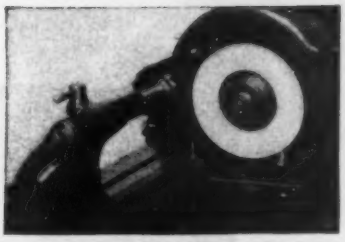
3. FASTER, SMOOTHER, MORE EFFICIENT CUTTING ACTION comes from the right selection of the various Norton abrasives plus the features of the *new process*. These wheels allow deeper cuts in expensive, heat-sensitive high-speed steel and cast alloy tools without drawing their temper. They also stay sharp longer . . . make frequent dressings unnecessary . . . a big saving in time and toolroom grinding costs.

RUN A TEST! If you haven't already standardized on Norton *New-Process* Wheels in your toolroom, run a comparative test right away. Your nearby Norton distributor or representative will help you select from the several types of Alundum* abrasives the wheels that will cut your costs on any tool grinding job.

NORTON COMPANY, Worcester 6, Mass.
Warehouses in 5 cities. Distributors in all principal cities.

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

NORTON
ABRASIVES
Making better products to make other products better

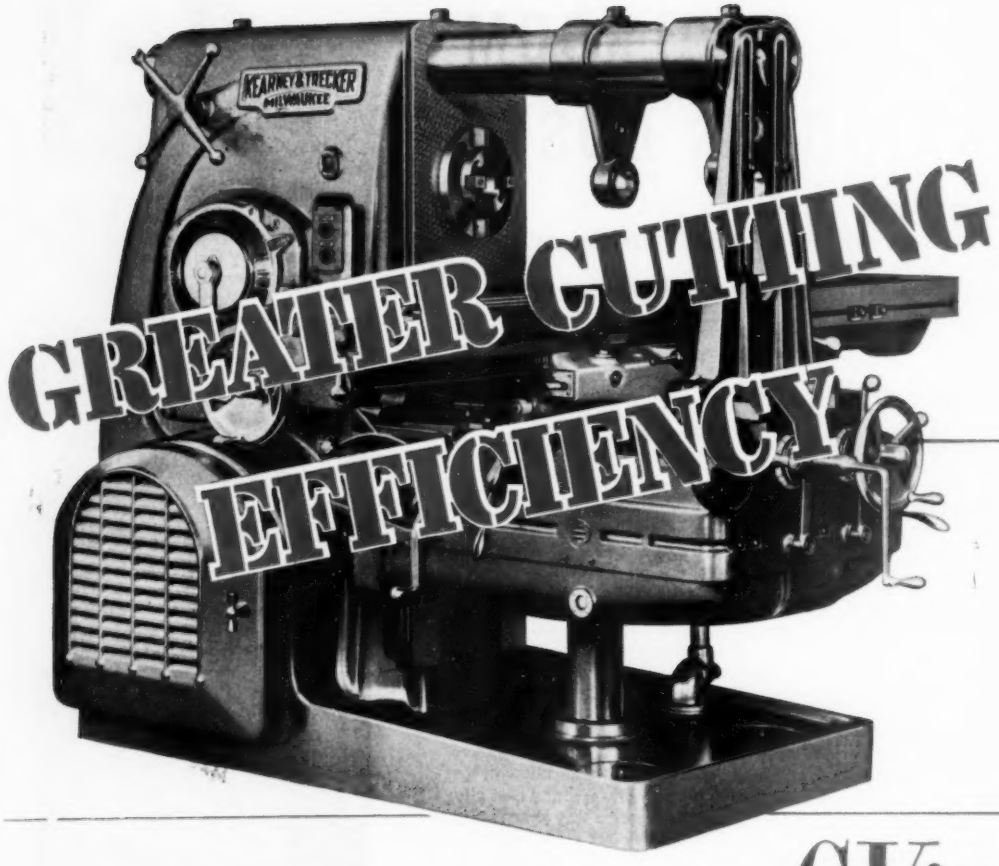


YOU SAVE TIME sharpening spiral milling cutters with Norton *New-Process* Alundum Wheels because they stay sharp and hold their size much longer than ordinary wheels.

YOU REDUCE SPOILAGE in backing off reamers with Norton *New-Process* Alundum Wheels because their free, cool cutting action does not draw the temper.

YOU GET CHATTER-FREE FINISHES when you use Norton *New-Process* Alundum Wheels on your toolroom surface grinders because their built-in balance makes them run smoother.

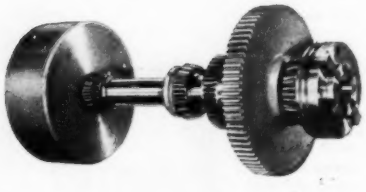
YOU GET ALL THE FACTS about lowering toolroom grinding costs in this 162-page handbook on Toolroom Grinding. Write for your free copy of FORM 835 A1.



GREATER CUTTING EFFICIENCY

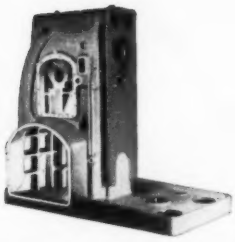
A new line of Knee-Type Milling Machines

KEARNEY & TRECKER MILWAUKEE **CK's**

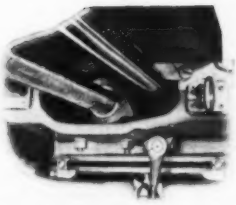


TAKE a look at the "business end" of a new CK milling machine — *the spindle* — with its dynamically balanced flywheel and Kearney & Trecker's famous extra-rigid, three-bearing spindle design. Added flywheel momentum gives you smoother, more positive cutter drive — the key to *Greater Cutting Efficiency* using modern cutting tools. Yes, and you get increased cutter life, too. The three-bearing spindle design affords ample support and greater rigidity — regardless of cutting loads. Heavy duty wide-faced spindle drive gears of forged steel are specially processed for longer life and exceptionally smooth, quiet operation. But this tremendously efficient spindle is only one of many pace-setting CK features. Look at the other features, too. See how they combine to give you the most productive, most profitable milling machines you can buy today — anywhere!

Replacement of obsolete machine tools is an



GREATER RIGIDITY — Yes, these new CK columns are the most rigid milling machine columns we've ever designed! They give you 1000 pounds more metal scientifically distributed in heavier ribbing, box section, sponson construction . . . to effectively absorb vibration from heaviest cutting loads.

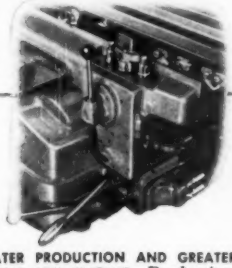


SMOOTHER FEED PERFORMANCE — with a new design 2" diam. heavy-duty, table feed screw that affords greater bearing contact and runs through an extra-long table feed nut. These new CK machines are equipped with a backlash eliminator for more effective climb milling, more accuracy and longer screw life.

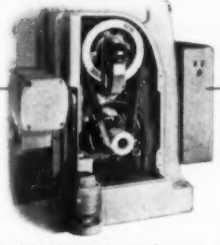
GREATER ADAPTABILITY — No. 60 Heavy Duty drive flange on Nos. 4, 5 and 6 machines enables use of heavy duty arbors with flange drive for large single or multiple cutter setups; or bolting large face-milling cutters directly to spindle nose. Average setups use standard arbors with No. 50 spindle drive.

NON-GLARE RAPID-SET DIALS—You'll avoid costly errors in reading and setting these new micrometer dials. They're vapor blasted to give you a satin surface with high contrast markings. They're easy and quick to set and provide positive lock at every setting.

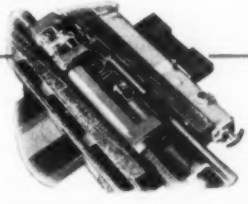
FEEDS AND SPEEDS TO TAKE FULL ADVANTAGE OF MODERN CUTTING TOOLS — and you really can do it with the broad feed and speed ranges on Kearney & Trecker's new CK milling machines. You get 24 spindle speeds (15 to 1500 rpm on Nos. 2 and 3, 13 to 1300 rpm on Nos. 4, 5 and 6) with Kearney & Trecker's automatic protecto-mesh shift to eliminate gear clashing. And there's the extra-wide feed range — 32 changes from 3/8" to 90" per minute—with separate 3 or 5 hp feed and rapid traverse drive.



GREATER PRODUCTION AND GREATER OPERATING CONVENIENCE—Production men will like Mono-Lever Control because it reduces idle cutter time, shortens floor-to-floor cycle time on both long and short run lots. Operators will like it because it makes faster, simpler, less fatiguing work for them.



GREATER HORSEPOWER — where you need it. That's what you get with new CK independent motor drives for spindle and for feed and rapid traverse. Depending on machine size (Nos. 2, 3, 4, 5 or 6), machines range from 10 to 25 hp for spindle drive and 3 to 5 hp for feed and rapid traverse.



GREATER MACHINE LIFE — through automatic lubrication and generously proportioned gears and shafts throughout for overload conditions. There's a forced flood system in the column and knee, and a positive metered, pressure pump system for table, saddle and knee ways, and table feed assembly.

Kearney & Trecker's new CK line of knee-type machines is designed to meet every demand of present-day milling . . . making them more accurate, and MORE PRODUCTIVE for you. Contact your Kearney & Trecker representative or write direct to obtain their complete specifications. Find out how CK machines easily replace obsolete machines at substantial savings to you. Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wis.

investment that makes Dollars and Sense.

Alloy Steel Products Co., Linden, N. J. finds the answer in Warner & Swasey Automatics

● Alloy Steel Products makes stainless steel valves for the chemical and oil industries. Production, limited to short runs, had been done profitably on turret lathes . . .

But now with *more* volume needed,

How to have plant expansion without building construction

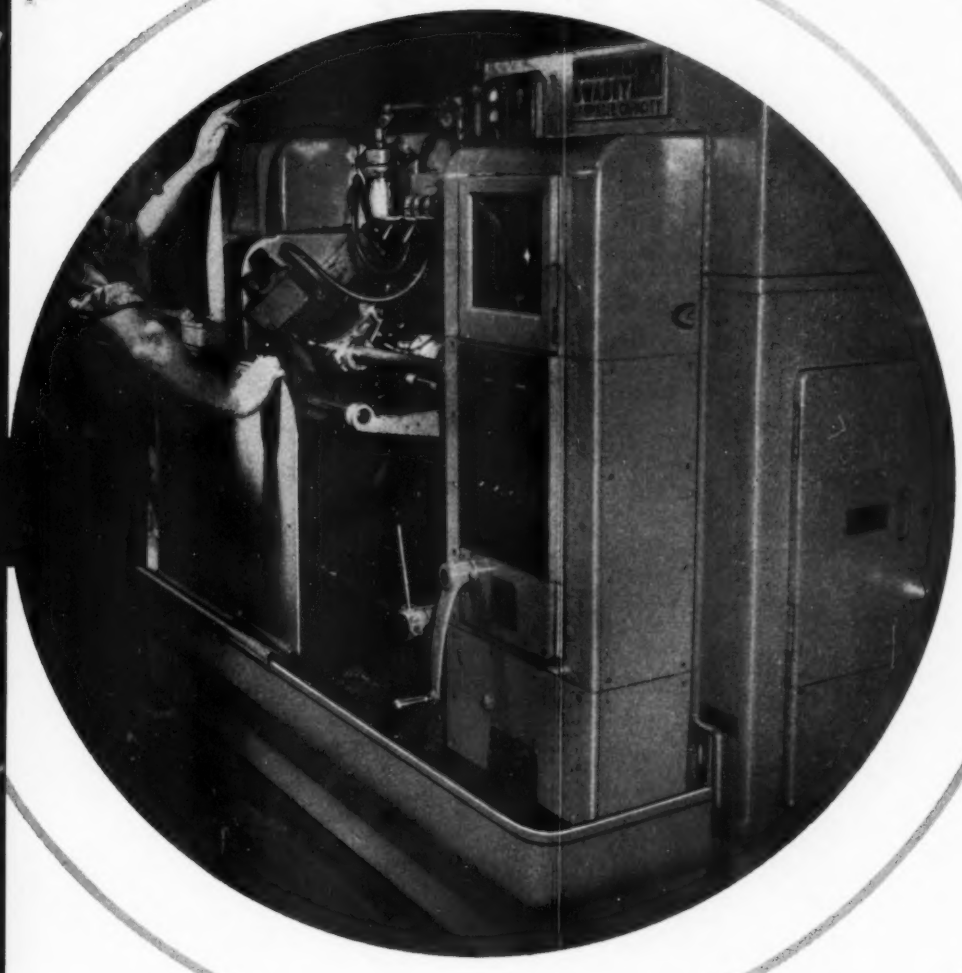
there wasn't room for more lathes, and construction costs for plant expansion was prohibitive. Subcontracting was tried, but these threatened to throw selling prices out of line.

The new CAMLESS Warner & Swasey 5-Spindle Automatic provided a solution. On these machines short and medium runs are practical, and Alloy Steel Products Company handles 69 different jobs in lots of 200 to 500, *profitably* on this new type automatic.

No investment in cam stocks—no setup man was needed!

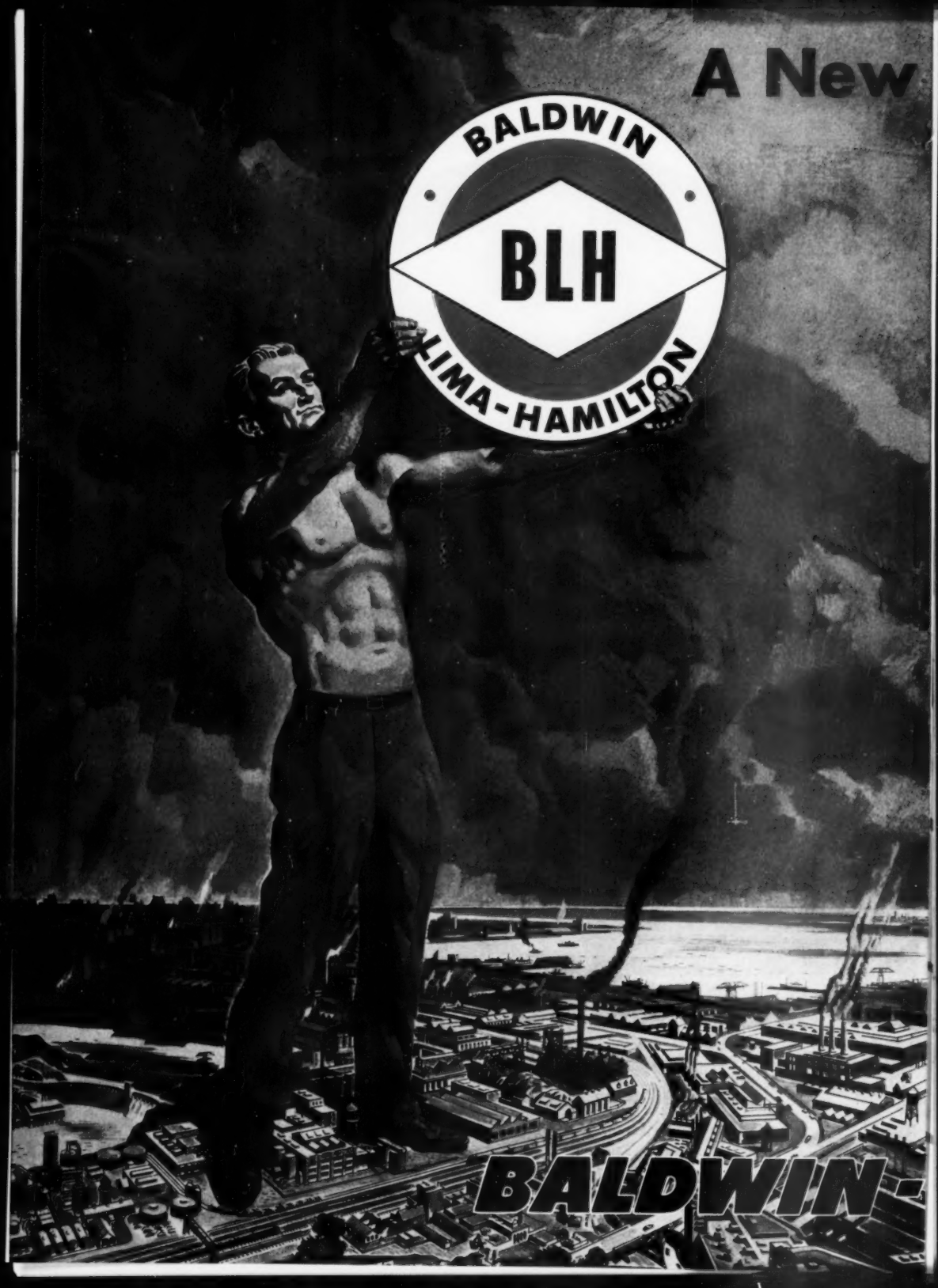
Volume—better in quality and finish—stepped up to an all-over average increase of 50% without need for additional floor space.

"IT'S SIMPLER TO SET UP A WARNER & SWASEY CAMLESS AUTOMATIC!"



turret lathes
multiple & single spindle automatics
precision tapping and threading machines

WARNER
&
SWASEY
Machine Tools
Cleveland


A New
BALDWIN
BLH
LIMA-HAMILTON
BALDWIN-

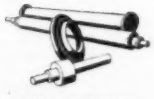
Symbol of Service to Industry

Representing the combined facilities of two of America's leading suppliers of industrial machinery and equipment, this new Baldwin-Lima-Hamilton symbol is backed by many decades of experience, a progressive and continuing research program, and the most modern engineering and manufacturing techniques. It represents the activities of eight plants spotted from coast to coast and numerous established sales outlets, strategically located for prompt, competent service.

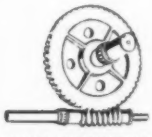
The dispersion of B-L-H manufacturing facilities permits "local" handling and delivery on many items to the important producing areas. It also conforms to the projected pattern for better national defense.

You have undoubtedly used many of the products offered by Baldwin, by Lima-Hamilton and by various subsidiaries, but you may not know, today, how well the Baldwin-Lima-Hamilton Corporation is equipped to supply your needs.

This array of products will suggest added opportunities for you to benefit from the expanded production-distribution-service facilities Baldwin-Lima-Hamilton now offers.



STEEL FORGINGS—Hammered and pressed steel forgings—rolled rings and flanges.

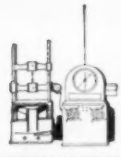


NON-FERROUS—brass and bronze alloy castings for heavy duty service.

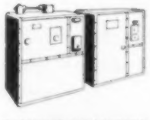
HYDRAULIC PRESSES—All types and capacities. Complete standard line.

POWER TOOLS—Bending rolls for plate fabricators and ship yards.

PLATE PLANERS—With design features to maintain accuracy, increase capacity.



TESTING MACHINES AND INSTRUMENTS—Universal, Fatigue, Stress Analysis.



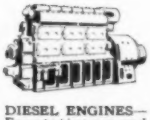
FATIGUE MACHINES—A complete range of sizes, for simulated service testing.

STRAIN GAGES AND INSTRUMENTS—For an accurate picture of stress distribution.

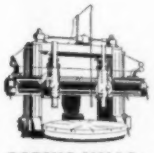
CRANES—Full range of capacities up to 110 tons, crawler and rubber mounted.

SHOVELS—Capacities from ¾-yd. to 6-yd. Design features increase output.

DRAGLINES—Available in variable capacities for economical earth-moving performance.

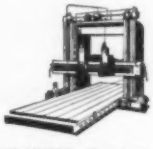


DIESEL ENGINES—For stationary and marine applications.



BORING MILLS—100" to 43' swing, with mechanical, electronic or hydraulic controls.

HEAVY DUTY LATHES—Line includes 40" to 168" engine lathes; or larger.



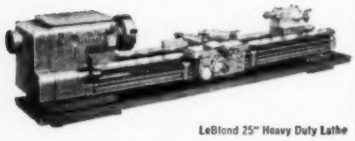
PLANERS—Standard models from 84" to 15'. Latest controls, every modern feature.

Baldwin-Lima-Hamilton Corporation, Philadelphia 42, Pennsylvania. **Plants:** Eddystone and Burnham, Pa.; Lima, Hamilton and Middletown, Ohio; Rochelle, Illinois; Greenwich, Connecticut; San Francisco, California. **Offices:** Chicago, Cleveland, Houston, New York, Philadelphia, Pittsburgh, San Francisco, St. Louis, Washington

LIMA-HAMILTON

LE BLOND proudly presents

we mesh fewer gears to give you greater power on...



LeBlond 25" Heavy Duty Lathe

LeBLOND HEAVY DUTY LATHES

The headstock design of LeBlond Heavy-Duty Lathes incorporates the free-running principle, with hardened and ground steel gears.

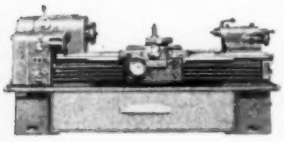
Result? Fewer gears in mesh at any given spindle speed to minimize no-load friction horsepower. More *smooth* power for your production work. Longer life from your LeBlond Heavy-Duty Lathe.

In addition to the Heavy-Duty Engine Lathe sizes shown, LeBlond builds a 20" Medium Duty Engine Lathe and accurate, versatile Toolroom Lathes in 12", 14", 16" and 20" sizes.

12"
14"
16"
20"
25"
32"

NOTE: *LeBlond also builds 40" and 50" Heavy-Duty Engine Lathes.*

you can't stump this toolroom expert



LeBLOND RT TOOLROOM LATHE

To our knowledge, the exclusive LeBlond 16" RT Toolroom Lathe has never been stumped! Infinitely variable speeds from 6 to 1500 r.p.m. Feeds from .0007" to 2.064". Threads from ¼ to 120—American, diametral, module and metric. 4-directional rapid traverse. Automatic chasing stop.

The RT is also built in a 16" Heavy Duty Engine model with 16 single-lever controlled speeds from 30 to 1537 r.p.m. 4-directional rapid traverse. Reverse to leadscrew at apron. Automatic chasing stop.

RT

BUILT-IN FEATURES

- 4-directional rapid traverse
- Combination gear and belt drive
- Automatic chasing stop
- Reverse to leadscrew at apron
- Single-lever positive-jaw feed control
- Single-lever speed choice
- Automatic lubrication through headstock, feedbox, apron

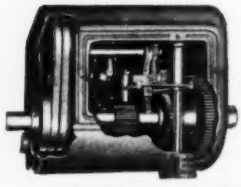
toolroom lathe

- Variable speeds—6 to 1500 r.p.m.
- 90 feeds—.0007" to 2.064"
- 90 threads—¼ to 120, American, module, metric
- Start-stop-reverse spindle control at apron
- 7½ horsepower motor

engine lathe

- 16 speeds—30 to 1537
- 60 feeds—.0013" to .230"
- 60 threads—2 to 120
- 15 horsepower motor

THIS LATHE USES ITS HEAD to give you full power at all twelve speeds from 28 to 1900 r.p.m.



LeBLOND DUAL-DRIVE

Dual Drive headstock design combines belt and gear drive to give you the widest range of speeds in the medium-price class—all at full horsepower.

Result? Smooth *full* power at high speeds—ideal for carbide and fine-finish turning. Rugged *full* power at low and intermediate speeds—for fast, efficient rough turning. Add convenient, single-lever speed control and the widest feed range in its class—and you have a lathe that does more jobs, faster, better, easier than any comparable machine.

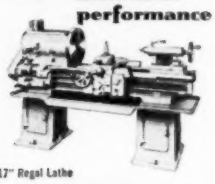
15

DUAL-DRIVE FEATURES

- 15" swing
- Combination belt and gear drive
- Twelve speeds from 28 to 1800 r.p.m.
- Ninety-six feeds from .0004" to .106"
- Forty-eight threads from 4 to 224
- Single-lever speed control
- Totally-enclosed feed box
- Electric brake, forward and reverse spindle control at apron
- Single-lever positive jaw feed control
- Automatic lubrication through headstock and feed box
- Hardened steel gears and anti-friction bearings
- Multiple automatic length stops
- One-piece apron
- Hardened and ground replaceable steel bed ways
- Taper key drive spindle nose

LeBlond Dual-Drive Lathe

these heavy-duty features improve light-duty performance on...



LeBlond 17" Regal Lathe

LeBLOND REGAL LATHES

- Geared Headstock
- Quick-Change Feed Box
- Separate Leadscrew and Feed Rod
- Taper Key Drive Spindle Nose
- One-Piece Apron

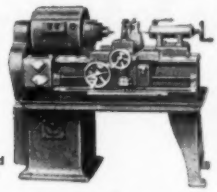
Why can LeBlond give you the most rugged, dependable performance in the light-lathe class? Because only LeBlond can tap the vast engineering and production facilities of a plant building 76 lathe models. Add to this LeBlond's 63 years of leadership in machine tool design and production . . . and you have the LeBlond *combination* for top value in lathes.

13"
15"
17"
19"
21"
24"

NOTE: *LeBlond also builds Regals in these models:*
13" Bench • 17", 19", 21", 24" Gap
17/28" and 19/30" Sliding Bed Gap

these LATHES for 1951

here's a production lathe with a stripped-down price tag



LeBlond 13" Rapid Production Lathe

LeBLOND "RAPID PRODUCTION"

The price tag is the *only* "stripped-down" feature about this lathe. It was designed *especially* for your high-production turning and facing to give you a production machine that will handle a *variety* of work within the range *you* choose.

The 13" Rapid Production Lathe may be ordered with your choice of three headstocks that give you any of the following speed ranges:

6 speeds from	68 to 400 r.p.m. 102 to 600 r.p.m. 200 to 1200 r.p.m.
4 speeds from	450 to 3600 r.p.m. 600 to 3600 r.p.m. 600 to 1800 r.p.m.
2 speeds	600 and 1200 r.p.m. 900 and 1800 r.p.m. 1800 and 3600 r.p.m.
Single speeds	900 r.p.m. 1800 r.p.m. 3600 r.p.m.

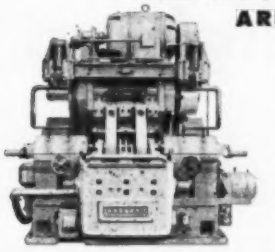
13"
17"
20"

PRODUCTIVE ATTACHMENTS

- Automatic back facing attachment
- Lever draw-in attachment
- Wheel draw-in attachment
- Air operated chuck
- Air operated tailstock
- Quick-acting, lever operated tailstock
- Special arbors
- Compound rest
- Plain and compound connected rests
- Plain connected rests
- Plain rest and turret tool post connected
- Taper attachment
- Standard multiple tool blocks
- Turret tool post on carriage
- Cross and length stops
- Chip Pan
- Motor driven coolant pump

17" and 20" machines are available with similar speed range choices

9 out of 10 crankshaft lathes built today ARE LeBLONDS



LeBlond 1LB Crankshaft Lathe

LeBlond has been *the* pioneer and developer of modern crank-turning equipment since 1905.

LeBlond makes Lathes for roughing and finishing all elements of any crank—small air compressor types, automotives and huge diesel engine crankshafts. The complete line includes automatic Lathes for mass production and universal Lathes for handling a variety of cranks.

LeBlond has the right machine for your job. Send your specifications in today for an estimate. Remember, more than 9 out of 10 Crankshaft Lathes built today are LeBlonds!

7ACS
automatic rough-turning of line bearings

DM
automatic finishing of line bearings

1LB
automatic rough and finish turning of line bearings, flange and stub ends

2LB
same as 1LB but larger

6AC
automatic chucking and rough or finish turning pin bearings

No. 1
universal crankshaft and automatic

26" UNIVERSAL HEAVY DUTY
universal for cranks of max. 3" throw

36" UNIVERSAL HEAVY DUTY
universal for cranks of max. 4" throw

LeBlond also builds

SLIDING BED GAP LATHES—16"/38", 25"/50" and 32"/60"
For a variety of parts with unusual or irregular projections such as shafts with large flanges, odd shaped blocks, large face diameters and many similar jobs requiring a flexible gap and center distance.

PLAIN BED GAP LATHES—12", 14", 16", 20", 25" and 32"
For jobs as above where adjustable gap is unnecessary.

HOLLOW SPINDLE LATHES—16", 27" and 30"
For oil country requirements or any work requiring large openings through the spindle.

AUTOMATIC LATHES—12" 16" and 3AC
For completely automatic machining with multiple tooling.

"HYDRA-TRACE" DUPLICATING ATTACHMENT
For smooth hydraulic turning and facing of a great variety of contours.

NO. 2 CUTTER GRINDER
Industry's standard for cutter sharpening and a wide range of toolroom grinding work.

COMPLETE LINE OF LATHE ATTACHMENTS

Sixty-four years of leadership in the design and production of machine tools stand behind every one of the 76 lathe models built by LeBlond. For the *right* lathe for your job, call your nearby LeBlond Distributor or write—

R. K. LeBLOND MACHINE TOOL COMPANY
Cincinnati 8, Ohio

Sales Offices in New York, Chicago and Detroit.

World's largest builder of a complete line of lathes.

LeBLOND of Cincinnati

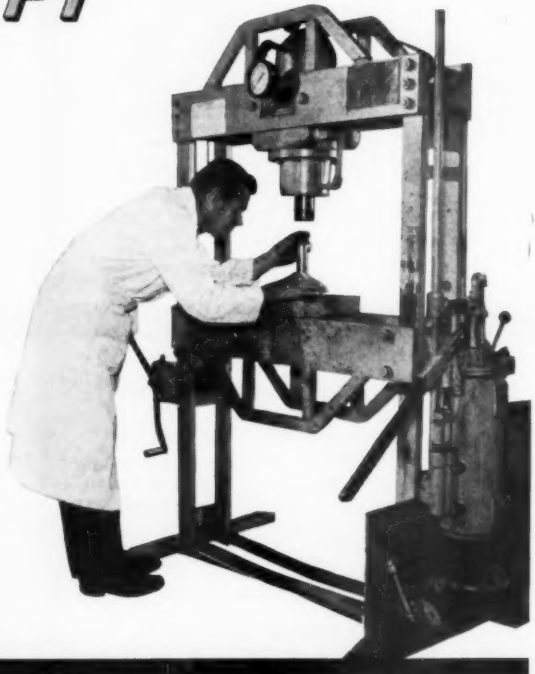
KRW helps straighten out problems at DOUGLAS AIRCRAFT

Douglas Aircraft Co. is doing a fine job strengthening America's air arm. And this K. R. Wilson 75 ton Hydraulic Arbor press is a valuable piece of equipment at Douglas' Santa Monica plant. It's used for straightening threads, pulling gears, and for general trouble-shooting and machinery maintenance.

World War II saw the creation of many special wartime uses for KRW Hydraulic presses. Special air-oil operated ammunition loading presses were supplied to bomb loading contractors. Machine shops on Navy ships were equipped with KRW presses. And many a bent propeller shaft on those doughty little Navy PT boats was straightened on a KRW press.

Need hydraulic presses in your war work? KRW has a complete line ranging from 25-150 ton capacities. Hand-operated, air operated or motor driven; either vertical or horizontal ram travel. They're all fast, flexible, self-contained above ground and easily converted to war or peacetime operations. If you need a specially-built press, let us know. Our engineering department will design the press to your needs.

Ask your machinery dealer to quote you or write or wire Dept 11.



K·R·WILSON

215 MAIN STREET • BUFFALO 3, N. Y.

Ask your machinery dealer to quote you or write or wire Dept 15.

Job No. KRW 23—K. R. WILSON—Final Proof
American Machinist—March 5, 1951
Machinery—April, 1951
Prepared by H. J. Weil, Inc.; Buffalo, N. Y.

Hardened Tool Steel Vees

60 ROCKWELL C

protect the carriage ways of

"AMERICAN" PACEMAKER LATHES

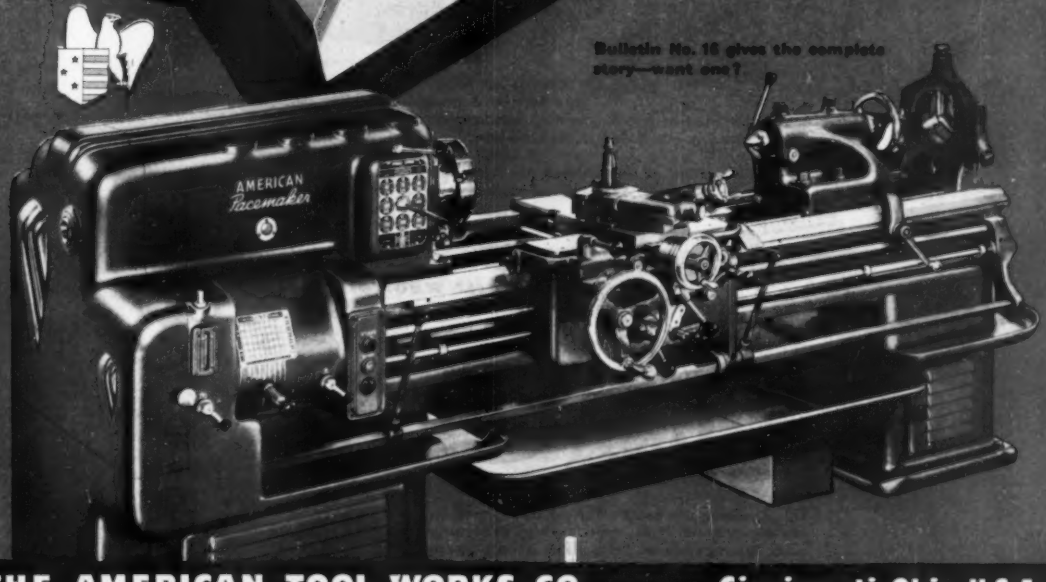
They are standard equipment on all "AMERICAN" Lathes

These hardened vees are made of solid tool steel and ground to gauge tolerances for interchangeability should replacement ever be required.

After hardening, the metallurgical structure is stabilized by cold treatment at minus 108° Fahrenheit to prevent twisting or warping.

This feature is but one of the outstanding advantages offered by the new "AMERICAN" Pacemaker Lathe.

Bulletin No. 16 gives the complete story—want one?



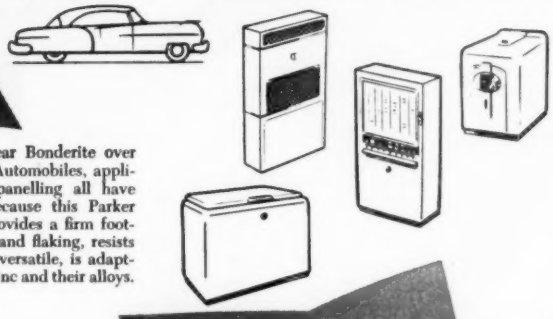
THE AMERICAN TOOL WORKS CO. Cincinnati, Ohio U.S.A.

LATHES AND RADIAL DRILLS

Parker Products...

BONDERITE

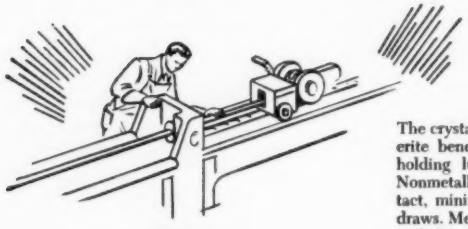
To anchor paint, preserve fine appearance



The best looking paint jobs wear Bonderite over the metal and under the paint. Automobiles, appliances, metal furniture, metal panelling all have longer lasting paint finishes because this Parker corrosion resistant paint base provides a firm foothold for paint, prevents peeling and flaking, resists rust and corrosion. Bonderite is versatile, is adaptable for use on steel, aluminum, zinc and their alloys.

BONDERITE

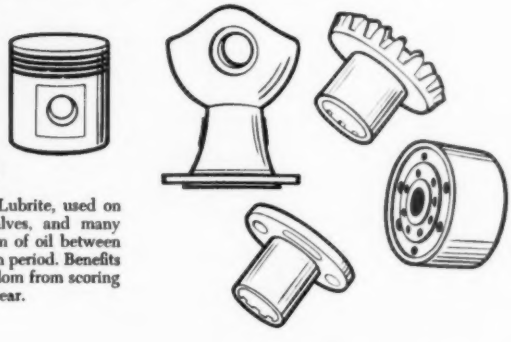
To make drawing smoother, easier



The crystalline phosphate coating created by Bonderite benefits drawing and forming operations by holding lubricant even under extreme pressures. Nonmetallic Bonderite prevents metal-to-metal contact, minimizes galling and scoring, allows deeper draws. Metal polishing costs are reduced by treating with Bonderite before forming.

PARCO LUBRITE

To resist wear on friction surfaces

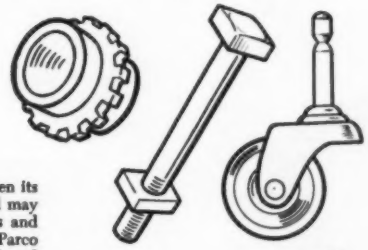


Oil absorbent, nonmetallic Parco Lubrite, used on pistons, cylinder walls, gears, valves, and many other bearing surfaces, holds a film of oil between moving parts in the critical break-in period. Benefits are faster, smoother break-in, freedom from scoring and scuffing, longer subsequent wear.

for metal treatment and metal finishing

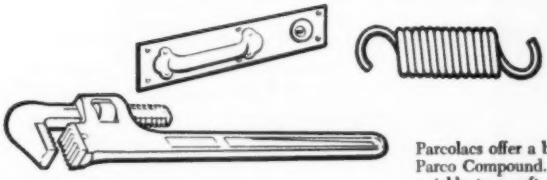
PARCO COMPOUND

For effective rust resistance



For a third of a century, this product has given its protection to iron and steel. Parco Compound may be used on wrought iron, stampings, castings and sheets. It stoutly resists rust and corrosion. Parco Compound is simple to use, easy to control and economical.

For excellent special finishes



PARCOLAC

Parcolacs offer a broad line of finishes for use after Parco Compound. Among them are stains that dry quickly to a soft, matte black which is handsome, long-wearing and easy to handle and apply. Other specialized finish requirements find their answer in Parker Parcolacs.

PARKER PRODUCTS MEET GOVERNMENT SPECIFICATIONS

SPECIFICATION	PARKER PRODUCTS
JAN-C-490, Grade I	Bonderite 100, 125, 140, 160, 170, 180
JAN-C-490, Grade II	
Type 2	Parco Cleaners 341, 350, 371
Type 4	Parco Cleaners 250 and 260
Type 5	Parco Cleaners 210 and 220
Type 6	Parco Cleaners 100, 101, 110
JAN-L-548	Parco Compound—Parco Powder
U.S.A. 57-0-2	
Type II, Class A and Class A1	Parco Lubrite 1, 2, 3
Type II, Class B	Parco Compound—Parco Powder
Type II, Class C	Bonderite 32, 34, 100, 125, 140, 160, 170, 180
U.S.A. 50-60-1C	Bonderite 100, 125, 160, 170, 180
U.S.A. 3-213	
Type I	Parco Cleaner 250
Type II	Parco Cleaner 260
AXS 1245	See JAN-C-490
QQ-P-416 Type III	Bonderite 32, 34
Navy Aeronautical M-364	Parco Compound—Parco Powder

PARKER RUST PROOF COMPANY
2196 E. Milwaukee • Detroit 11, Michigan

WANT MORE INFORMATION?

Call or Write Today!

Parker Rust Proof Company
2196 E. Milwaukee, Detroit 11, Michigan

Please send me complete information on the Parker Products indicated below:

☐ Bonderite ☐ Parco Lubrite ☐ Bonderite as an aid in drawing
☐ Parcolacs ☐ Parco Compound ☐ Gov't. Spec. No. _____

NAME _____

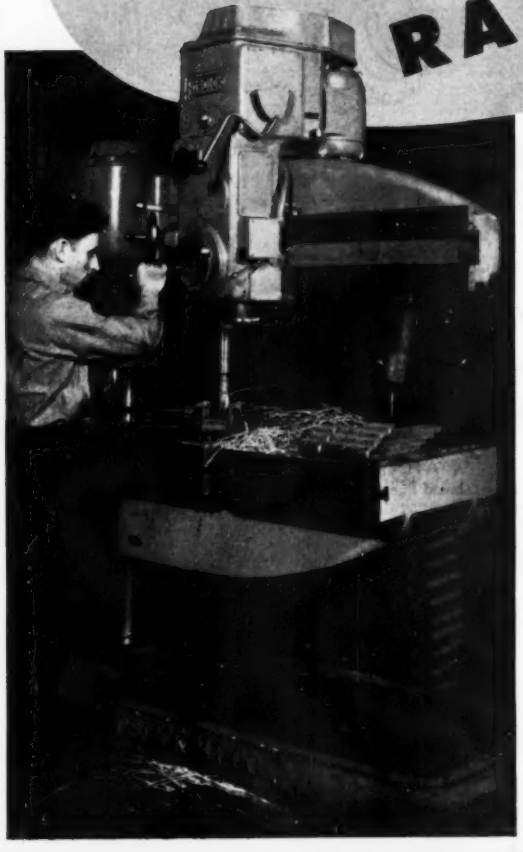
FIRM _____

ADDRESS _____

CITY _____ STATE _____

For Sensitive Drilling up to 1 1/2" diameter – use a

FOSDICK *Sensitive* RADIAL



● Your first saving with a Fosdick Sensitive Radial begins at the point of sale as the initial investment is moderate. From then on its many economies are the result of its wide application to sensitive drilling operations and the ease of control and operation. In this new machine you get the sturdy construction and rigidity of a radial plus the high speed characteristics of a sensitive.

Note the installation shown—the work is mounted on an adjustable table which swings in an arc of 360°. You can always locate the table in the correct position for the job at hand. The arm is at a fixed height and also swings in an arc of 360°.

All controls, being centralized on the head, are always within easy reach of the operator from his normal working position. The machine has nine spindle speeds and four spindle speeds and four spindle feeds, fast traverse to the head, table that may be moved by hand or power, a tool ejector and a new patented semi-automatic tapping control.

For all around utility you can't beat this new Fosdick Sensitive Radial. Complete details of construction and operation are available in the Fosdick Sensitive Radial Bulletin S. R. A. Write for yours.

FOSDICK MACHINE TOOL CO.
CINCINNATI 23, OHIO

Productivity
from Brown & Sharpe

You Can Select Faster, More Efficient PRODUCTION

from the broader range of Brown & Sharpe Cutters

The closer you match your cutters to each job, the faster, more efficiently they will cut . . . and the less power it will take.

Brown & Sharpe offers a complete range of cutters that permits accurate selection of exactly the right cutter for each cutting job! Styles include every type from plain milling cutters and end mills to metal slitting saws and cutters for special uses. And every cutter is a *quality* product . . . designed and produced to fulfill the enduring accuracy built into today's milling machines.

Whenever you order cutters, specify Brown & Sharpe and be sure of getting maximum cutter productivity. Write for complete catalog.

Here's PREPAREDNESS of the Soundest Kind

3 Brown & Sharpe Machines

that equip you to mill small and medium-sized parts fast, accurately, economically

The greatest service you can render to your company today, is to make sure that your plant facilities are prepared to meet increasing demands for accurately-made small and medium-sized parts at low cost.

That is why it will pay you to investigate the three manufacturing-type Brown & Sharpe Milling Machines shown here. They are specifically designed for mass producing milled parts, with uniformly high precision and minimum demand on the operator's time and attention. Adapted to an almost endless variety of jobs, they assure you continuing big returns on a moderate capital investment. Write for detailed catalog and specifications.

No. 12 PLAIN MILLING MACHINE
3 h.p. Spindle Drive

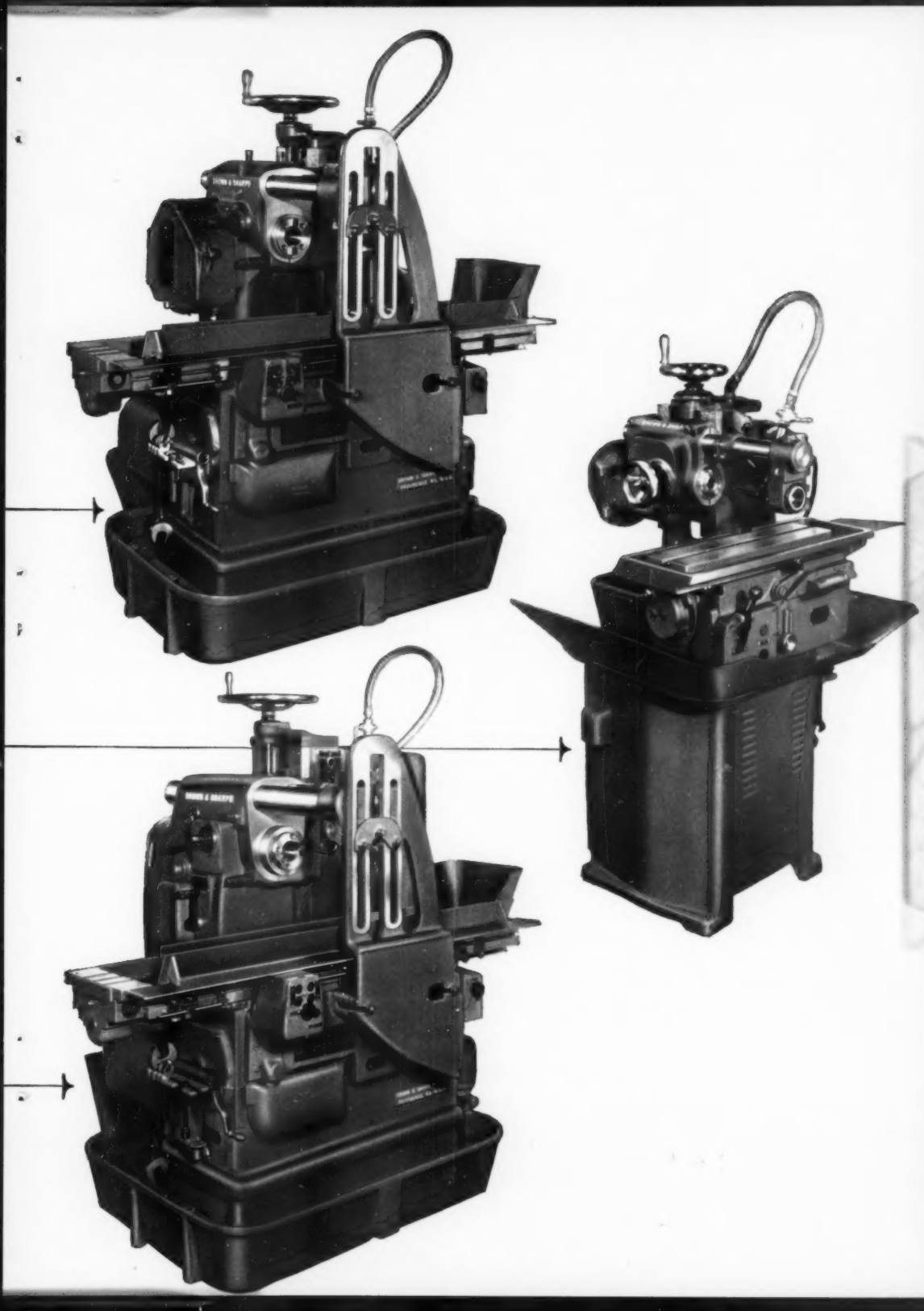
Complete electrical control of all power movements gives unusually precise, smooth performance with outstanding ease and flexibility of operation. Wide variety of automatic cycles obtainable, with time-saving dual feed rate. Ample capacity for the majority of medium-sized work. Climb milling in either direction permitted by built-in backlash eliminator.

No. 000 PLAIN MILLING MACHINE
½ h.p. Spindle Drive

For economical, fast production of small pieces such as parts for firearms, sewing machines, radios, etc. Automatic cycle and minimum fatigue for operator afford uniform rate of production. Uniform, positive feed gives long cutter life.

No. 12 PLAIN MILLING MACHINE
7½ h.p. Spindle Drive

Same features and advantages as the 3 h.p. model, but powered for heavier cuts, including many moderate-sized carbide milling jobs.



Quality Control Equipment that Speeds Precision Work . . .

JOHANSSON GAGE BLOCKS

With Brown & Sharpe Jo-Blocks on the job, mass-produced parts can be held to specified tolerances with minimum time-loss for checking or re-setting gages. Every department is equipped with accurate, easy-to-use standards that enable prompt detection of any wear or incorrect setting in gages that might cause high rejection rate.

In addition, Jo-Blocks serve as reliable master laboratory standards for speedy accurate setting of work standards; and as positive guides for accurate layout and set-up work. Made in 3 guaranteed accuracy standards: .000002", .000004" and .000008" . . . sold as single blocks or in sets. Write for catalog.

Time-Saving, Money-Saving

GROUND FLAT STOCK

Oil hardening · Water hardening

The economies of using steel stock accurately pre-ground to size are now available to you on an even broader scale. Brown & Sharpe offers a choice of oil or water hardening types in 16 different thicknesses from 1/64" to 1" . . . a total of 145 sizes. What's more, in eight thicknesses up to and including 3/16", a single type of stock now serves for either oil or water hardening . . . a convenience available only in the Brown & Sharpe line.

Further conveniences of Brown & Sharpe Ground Flat Stock include continuous repeat markings and a protective envelope in distinctive color on every piece . . . for instant identification. Write for folder.

WE URGE BUYING THROUGH THE DISTRIBUTOR

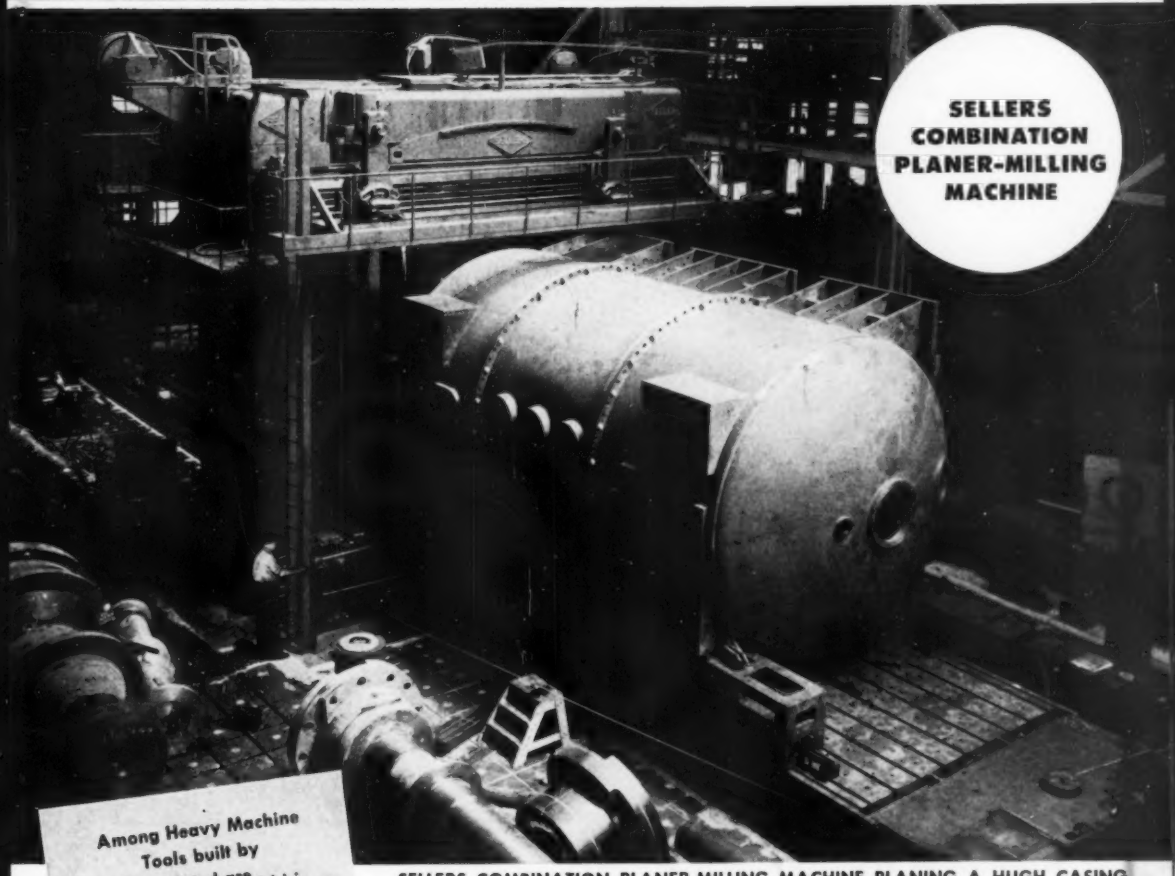
Printed in U.S.A.

Brown & Sharpe

Milling Machines • Grinding Machines • Screw Machines • Cutters • Machinists' Tools
Machine Tool Accessories • Electronic Measuring Equipment • Johansson Gage Blocks • Pumps

BROWN & SHARPE MFG. CO., PROVIDENCE 1, R. I., U.S.A.

ANOTHER GIANT CONSOLIDATED SPECIAL MACHINE FOR UNUSUALLY LARGE WORK



Among Heavy Machine Tools built by Consolidated are . . . .

- LATHES
- BORING MILLS
- DRILL PRESSES
- MILLING MACHINES
- BORING MACHINES
- COLD SAW MACHINES
- BORING, DRILLING AND MILLING MACHINES
- DRILL AND TOOL GRINDERS
- PLANERS
- SLOTTERS
- RAILROAD SHOP TOOLS
- AUTOMOTIVE TOOLS
- AND OTHER SPECIAL MACHINES

SELLERS COMBINATION PLANER-MILLING MACHINE PLANING A HUGH CASING

The Sellers Combination Planer-Milling Machine is used in the production of equipment for industrial and power generating applications such as, synchronous condensors, hydraulic turbine-driven generators and large motors and generators for steel mills and similar installations. Two machines in one . . . a planer and a miller . . . it eliminates the necessity of transfering work from one machine to another when both planing and milling operations are required. This huge machine is over 76 feet long, 27 feet high and weighs more than 645,000 pounds. It has the capacity to machine work 14 feet wide, 16 feet high and 30 feet long. Due to the enormous capacity of the machine, several parts to be machined may be bolted together and handled as a single unit.

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

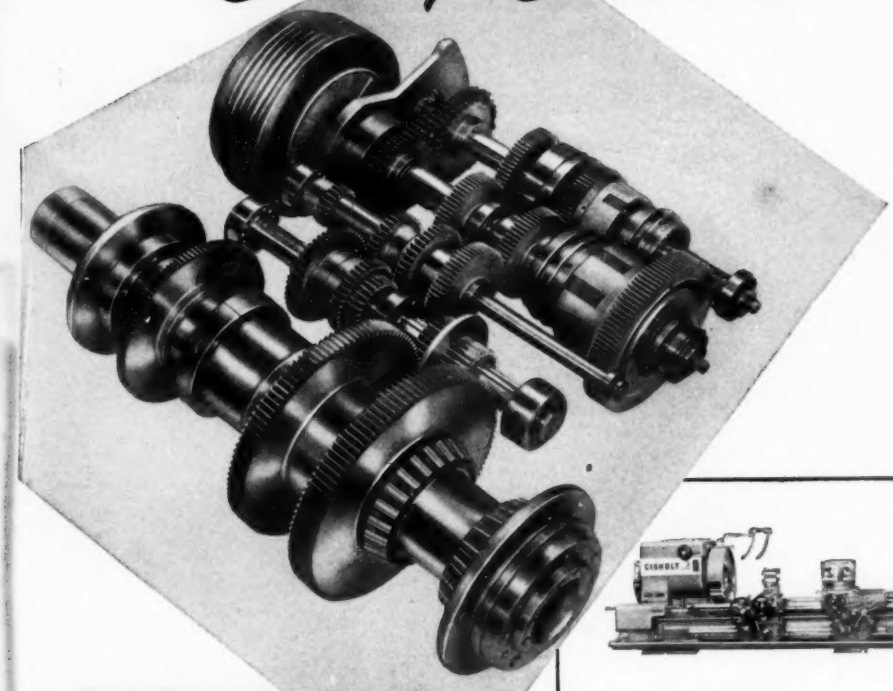
CONSOLIDATED MACHINE TOOLS

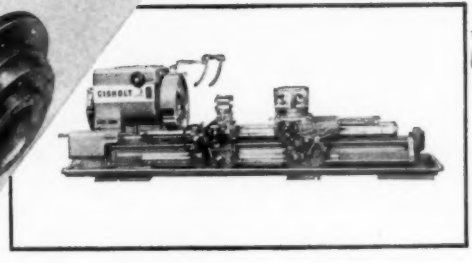
CONSOLIDATED
MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

RUGGED POWER

Silky Smooth





GISHOLT
Saddle Type Turret Lathes

Here's how modern Gisholts are geared for greater production—to deliver smooth, vibrationless power—instantly responsive—dependable for years to come. Note these outstanding features:

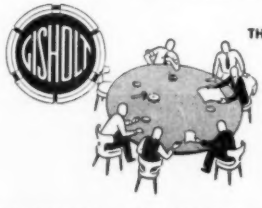
1 *Gears* . . . Husky headstock gearing will carry all the horsepower and all the load of today's tools, as well as that of the foreseeable future. Rigidity is complete from the massive headstock casting right through to the ground teeth in each gear.

2 *Clutches* . . . Warner Electric Clutches inside the drive pulley do all forward and reverse driving, as well as inching and braking. They never need adjustment and give the smoothest acceleration and braking power ever put on a turret lathe. Instant HI-LO speed changes are obtained at the touch of a finger through hydraulically operated multiple disc clutches.

3 *Bearings* . . . Two precision tapered roller bearings at the front of the spindle, together with the precision ball bearing at the rear, carry all the radial and thrust load you can give them.

Why not get all the facts? A new bulletin on Gisholt 3L, 4L, 5L Saddle Type Turret Lathes is just off the press. Write for it.

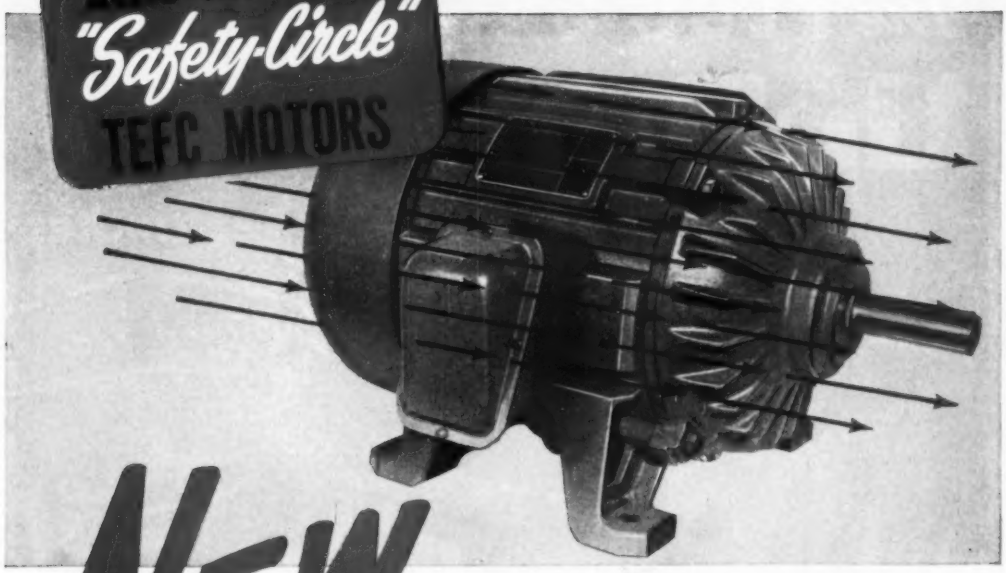
GISHOLT MACHINE COMPANY
Madison 10, Wisconsin



THE GISHOLT ROUND TABLE

represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES



NEW Easy to Clean Protected From Dirt

THIS NEW *Safety Circle* totally-enclosed, fan-cooled motor cannot clog with dirt. The ribbed cooling surfaces are outside the motor. There are no pockets or crevices where dirt can collect. Cooling air is not enclosed at any point except the fan cover.

Cleaning is the simplest of maintenance operations done in a few seconds with an air hose. The fan cover also can be removed very quickly for a thorough cleaning.

Factory Lubricated Bearings

Bearings are lubricated at the factory and operate without attention or cost for years. The frame of this *Safety Circle* TEFC motor is cast iron, inherently corrosion resistant, strong and rigid. The extra rigidity of the cast iron frame holds the bearings in true alignment under severe operating conditions. This gives long bearing life and low operating costs.

Get All The Facts

The new *Safety Circle* totally-enclosed fan-cooled motor is built in all NEMA standard frame sizes from 224 to 505. Your Allis-Chalmers Authorized Dealer or Sales Office has complete information. Call today or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 51B6144. A-3235

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems

TEXROPE — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.

PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

Safety Circle, Texrope and *Vari-Pitch* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

The PLUG GAGE of TODAY

DuBo* with High Visibility

COLOR FLASH —Handles

Already recognized as the leading bore checking gage of the fixed limit type, STANDARD DuBo Gage NOW brings you even more positive color identification of the "go" and "not go" members. Single end gages, sizes 1.510" to 6.010", are now furnished with solid red or green plastic handles. Double end gages, sizes .240" to 1.510", have large red and green bands on a handle redesigned for even greater speed and efficiency in use. No fumbling, no confusion, with these new DuBo Gages.

Double end DuBo Gage for small size bores

*U.S. and Foreign Patents Granted

And of course . . . all of DuBo's other advantages:

DEFINITE CHECK: No borderline cases with DuBo. Whether or not handle drops freely below center is definite yes-or-no answer.

LIGHTNESS IN WEIGHT: As much as 70% to 80% lighter than a cylindrical plug gage of equivalent size.

SELF-PILOTING: Utter ease of entering is a real and definite time-saver. Relieves nervous strain of fussy positioning.

LONG WEAR-LIFE: Outlast ordinary cylindrical plug gages many times and maintain accuracy throughout exceptionally long life.

It all means effective gaging WITH economy.

STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

RESINIZED METALITE® CLOTH BELTS

Piece after piece of these auto grills goes through in jig time, with flash marks removed, all ready for the plating operation. The muscles in the arm of the operator show he's shoving the work hard against the belt, with complete assurance of freedom from scratches, wild grain marks, or undue heating. The resinized bond, in itself immune to heat, also prevents excess heat by holding the electro-coated abrasive grains up to their work so they cut — not rub — and generate a minimum of heat, most of which is dissipated in the long belt travel from the contact wheel to the idler pulley and back to the point of contact.

The right METALITE belts and contact wheel can put your finishing operations at a new high for speed and profit. Check with BEHR-MANNING Field Engineers — they'll recommend the right method and prove its excellence in a demonstration. Write us now.

THE LATEST IN BELT FINISHING

Get your copy of this Belt Finishing Brochure. It's full of the newest ideas and data to cut finishing costs. Mail the coupon.

BEHR-MANNING
TROY, N. Y.

Use NORTON® abrasives Sharpening Stones

BEHR-MANNING, Troy, N. Y., Dept. AM-3

Please send me your Belt Finishing Brochure.

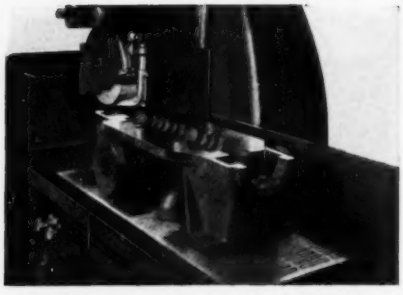
Name ..... Title .....

Company .....

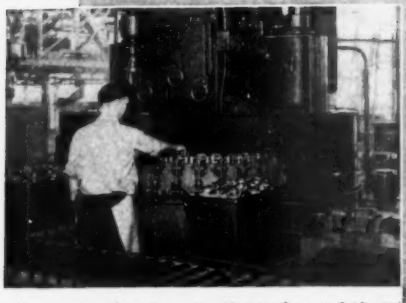
Street ..... County .....

City ..... Zone ..... State .....

WHERE THERE IS A FLAT SURFACE TO GRIND THERE'S A MATTISON TO GRIND IT.



40 hours before — now 4 hours. Pump case ground on Mattison Horizontal Spindle Precision Surface Grinder.



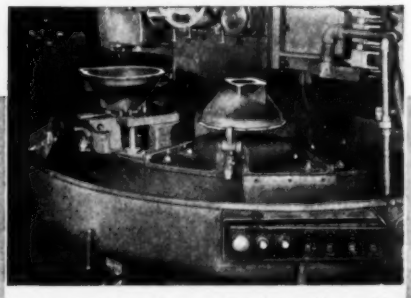
700 connecting rods per hour, using 40 station fixture to finish grind crank and wrist pin end of assembled rod with Mattison No. 72 Grinder.

With the addition of the production grinding machinery formerly made by the Hanchett Manufacturing Company, Mattison is now in a position to work with you on all your surface, face and disc grinding problems. These machines are made in various types to handle a wide range of work. Experienced engineers are available to give you best production efficiency, finish and tolerances, with Mattison machines.

For any flat grinding ask for our recommendations on the proper method and machine for your job. No obligation, of course.

For catalogs on any of the types shown or if you would like a copy of the general bulletin, let us know and we'll gladly send them to you.

Grinding Cast-Iron Cams — 5" diameter, 1½" thick — stock removal, each side .030". Production 120 surfaces per hour on Mattison (Hanchett Type) Rotary Surface Grinder.



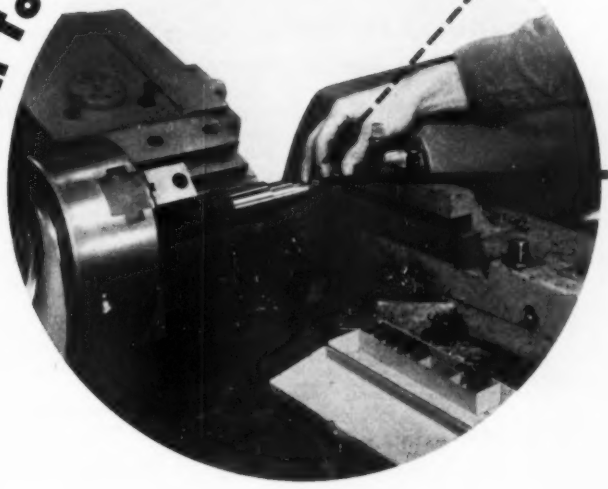
200 Transmission Case surfaces ground per hour on Mattison (Hanchett Type) Rotary Automatic Grinder. A special 8-station mechanical fixture permits one operator to grind each end of this large 35 lb. casting, flat and parallel. Stock removal .050".

320 surfaces of cast iron compression heads per hour, removing 1/32" stock with Mattison No. 24 Rotary Surface Grinder.

MATTISON MACHINE WORKS

ROCKFORD • ILLINOIS

How to STOP the CLOCK on Tool Change Time



You can change Indexible Insert Tools on the Monarch Mona-Matic in *Just 8 Seconds Flat!*

MONARCH INSERT TOOL KIT, with tool holder and 9 inserts, each with 3 cutting edges on each end. These 54 cutting edges can be identically reground by merely squaring end and grinding chip breaker if desired. Cuts tool costs and tool change time to a fraction.

THE FAMOUS MONARCH MONA-MATIC—the ultimate for production turning operations. Let us prove with actual job performance reports, how it outperforms ordinary multiple tool machining methods.

Contrast this procedure with the conventional solid tool change! Don't touch the tool holder adjustment. Take a turn on the clamp screw—lift out the indexible insert, revolve it on its axis and replace it—tighten the same screw. *That's it!* You haven't changed your tool setting in any way. You don't need any trial cuts—any new miking of the job—any resetting of the tool. Just start removing metal where you left off.

Here's the simplest and quickest tool change found on *any* production turning equipment. Applying it to the Monarch Mona-Matic is almost like gilding the lily. Even with conventional solid tools, this high-output production lathe can show you truly amazing results in increased production, lower tool costs, shortened setup time and subsequent grinding time. We mean BIG results, which we will gladly substantiate with job data. And with insert tools, the Mona-Matic's even better!

Just one more minute! You're always reading ads that say "Write for details." This time, *do it* (requesting Booklet 1804)—and enjoy the inevitable result in your future operating statements . . . *The Monarch Machine Tool Co., Sidney, Ohio.*

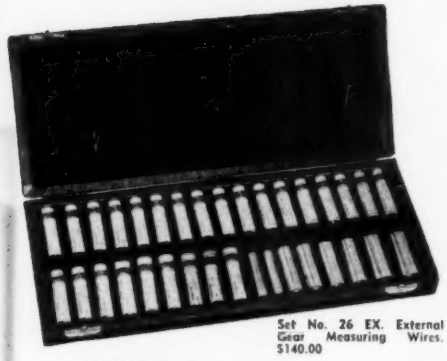
FOR A GOOD TURN FASTER—TURN TO MONARCH

Monarch

ACCURACY • ECONOMY • LONG LIFE

TURNING MACHINES

ACCURACY *the* EASY WAY...
with the
Van Keuren >>>> GEAR MEASURING SYSTEM
Spurs, Helicals, Splines, Serrations



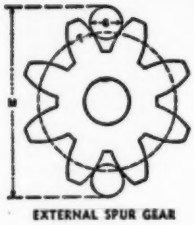
Set No. 26 EX. External Gear Measuring Wires. $140.00

THE Van Keuren Gear Measuring System is generally accepted as the easiest and most accurate method of checking tooth thickness of gears, 30° involute splines and 90° involute serrations. A measurement is made over two opposing wires and this actual measurement is compared with the theoretical measurement over wires for a perfect gear as computed from the Van Keuren tables for 1 diametral pitch gears.

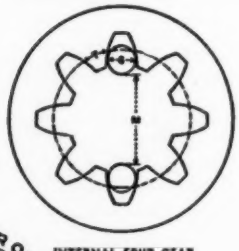
The only equipment required is a set of 2 wires of the proper size for each diametral pitch.

Standard sizes of wires available from stock are:—

1.728"/DP	for external spurs and helicals.
1.44"/DP	for internal spurs and splines.
1.92"/DP	for enlarged pinions, 30° involute splines and 90° involute serrations.
1.68"/DP	Alternate series for special requirements.



EXTERNAL SPUR GEAR



INTERNAL SPUR GEAR

SIMPLE . . . For spur gears, involute splines and serrations, the only calculation is one of simple division. For helical gears use the simplified computation forms VK-103, VK-104 or VK-105.

RELIABLE . . . The 1.728"/DP System is used by over 90% of American gear producers and users. The 1.44"/DP and 1.92"/DP systems have been incorporated in standards for involute splines and serrations.

ACCURATE . . . The Van Keuren Gear Tables are complete for gears from 5 to 500 teeth and for pressure angles of 14½°, 17½°, 20°, 25° and 30°. If the measurement over the wires is greater than the value calculated from the tables, the tooth is too thick and the cutter must be fed further into the gear blank. Constants for controlling tooth thickness and backlash to .0001" are given for all pressure angles.

MEMBER OF AGMA

CATALOG AND HANDBOOK No. 34

This 208 page volume represents 2 years of research sponsored by the Van Keuren Co.

It presents for the first time in history a simple and exact method of measuring screws and worms with wires.

It tells how to measure gears, splines and involute serrations. It is an accepted reference book for measuring problems and methods.

Copies now free upon request.

THE *Van Keuren* CO., 173 WALTHAM STREET, WATERTOWN, MASS.

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You'll get better production when you make jobs better with Cimcool. Let a demonstration in one of your own machines convince you. Just write us and we'll have one of our Cincinnati Milling-trained machinists call on you. Or, if you prefer, send for our free booklet "CIMCOOL Gives the Answers." Address, Sales Manager, CIMCOOL Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

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for 85%
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Greater Productivity Plus . . .
. . . increasingly closer tolerances on new products demand better methods. Now is no time to tolerate old machines. Users attribute high production and sustained accuracy to New Britain Precision Boring Machines.
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Tough drilling job got you *Trapped?*

USE the best tools to get out tough jobs. They save time and save production costs. Standard Red Shield Tools are tops—in material—design—construction.

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THE STANDARD LINE: *Drills • Reamers • Taps • Dies • Milling Cutters • End Mills • Nobs • Counterbores • Special Tools*

7 FEATURES that will increase your Turning Production on *both* Short and Long Runs

The productive advantages of multiple tooling and automatic cycling are available on short runs as well as on mass production turning with Sundstrand Automatic Lathes.

The following seven important design features of these Automatic Lathes make it possible for you to obtain these same benefits:

Quick set-up for short runs is accomplished by simply adjusting dogs on a graduated disk. No cycle control cams are required.

1 Quick Cycle Changeover
So the adjustments for various sizes and types of parts can be made rapidly with a minimum of down-time.

2 Simplicity of Tool Adjustment
So that operators or set-up men can readily learn to make tool set-ups and changeover.

3 Wide Range of Carriage Cycles
Easily adjusted for many different sizes of parts and types of tool uses.

4 Wide Feed and Speed Range
Suitable to cover a wide range in materials and sizes of parts to be machined.

5 Adequate Horsepower
So that multiple tooling can be used to shorten cutting time; also so that carbides and other modern cutting tools can be used to capacity.

6 High Rapid Traverse Rate
So that cutting tools can be advanced to the cut and returned after the cut in the least possible time.

7 Automatic Cycling
For accurate duplication to close limits of all parts in the lot. Also so that operator can, on occasion, run more than one machine.

SUNDSTRAND

RIGIDMILS • FLUID-SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT

You'll Get These 7 Features on Work in any Lot Size...

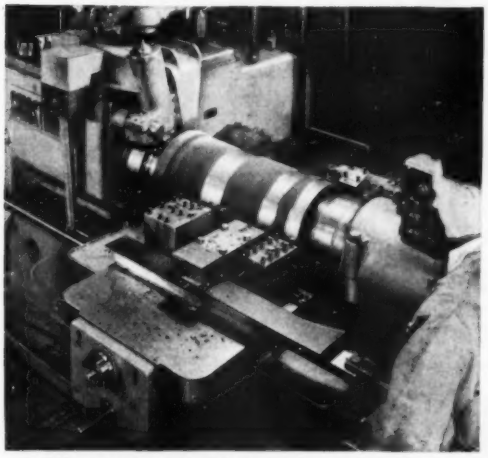
Yes, all of the seven foregoing features are included in each Sundstrand Automatic Lathe. Probably of greatest importance of these features is the quick cycle changeover. It makes it highly practical to include short runs on multiple tool jobs. On an average job using five tools, a Sundstrand can be set up in less than thirty minutes.

... In All Sundstrand Automatic Lathes up to 17½" Swing

The line of standard Sundstrand Lathes consists of the Models 4A, 8A, 12A and 16. In addition, center drive lathes and special lathes can be furnished to suit special job requirements.

... Within Range of 3 to 75 HP

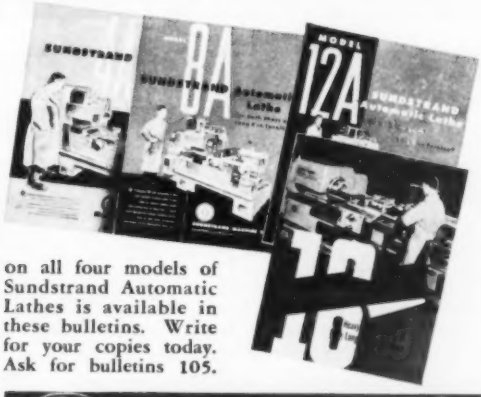
You'll find plenty of horsepower for your tougher jobs or a horsepower range to suit your work in Sundstrand Automatic Lathes. The complete line of machines embraces a horsepower range of from 3 to 75 hp.



This Model 16 Sundstrand Automatic Lathe saved 66 hours in the rough and finish turning of a lot of 20 cylinder liners. Parts are 32" long by 15-1/4" diameter.

This 50 hp Model 12A Sundstrand Automatic Lathe has cut turning time 70% over previous method on universal joint parts. Job illustrated is just one of 12 similar parts run over this machine.

FREE ADDITIONAL DATA:



on all four models of Sundstrand Automatic Lathes is available in these bulletins. Write for your copies today. Ask for bulletins 105.

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Machine Tool Company
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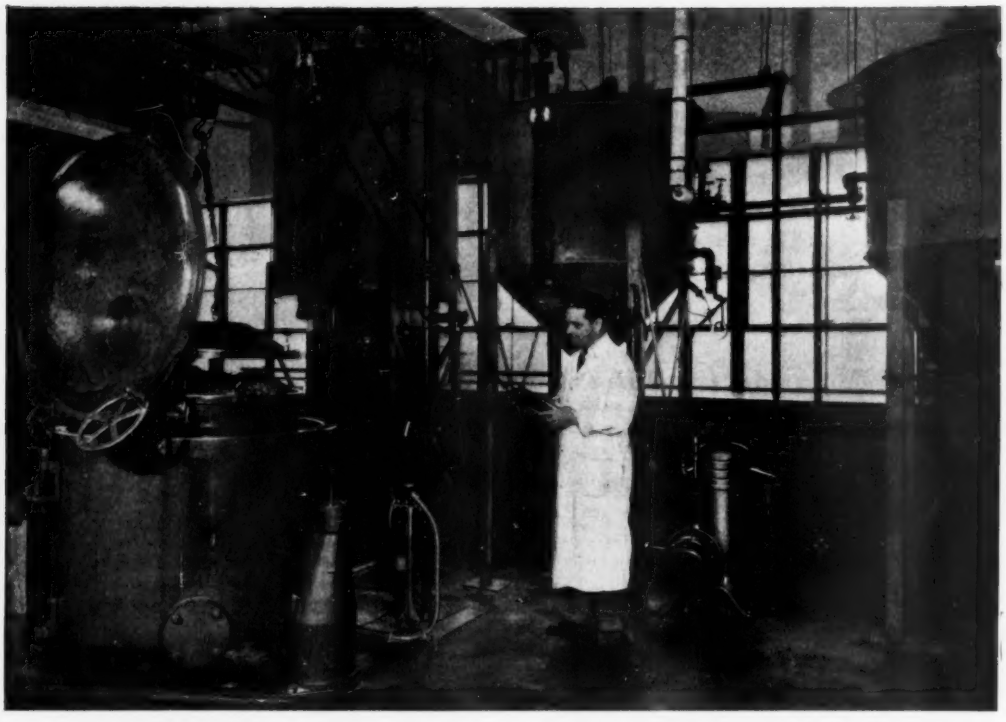
DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES



A CUTTING OIL RECLAMATION SYSTEM THAT PAYS ITS OWNER WELL!

This De Laval Cutting Oil Reclamation System in a New England machinery manufacturing plant pays good dividends. Consisting of a De Laval Chip Extractor, a De Laval Oil Purifier and necessary cone-bottomed tanks and De Laval-IMO Pumps, it recovers the used oil from chips, removes all impurities from the oil and returns it to safe usefulness.

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Ask for information on how a De Laval Cutting Oil System will save **you** money.

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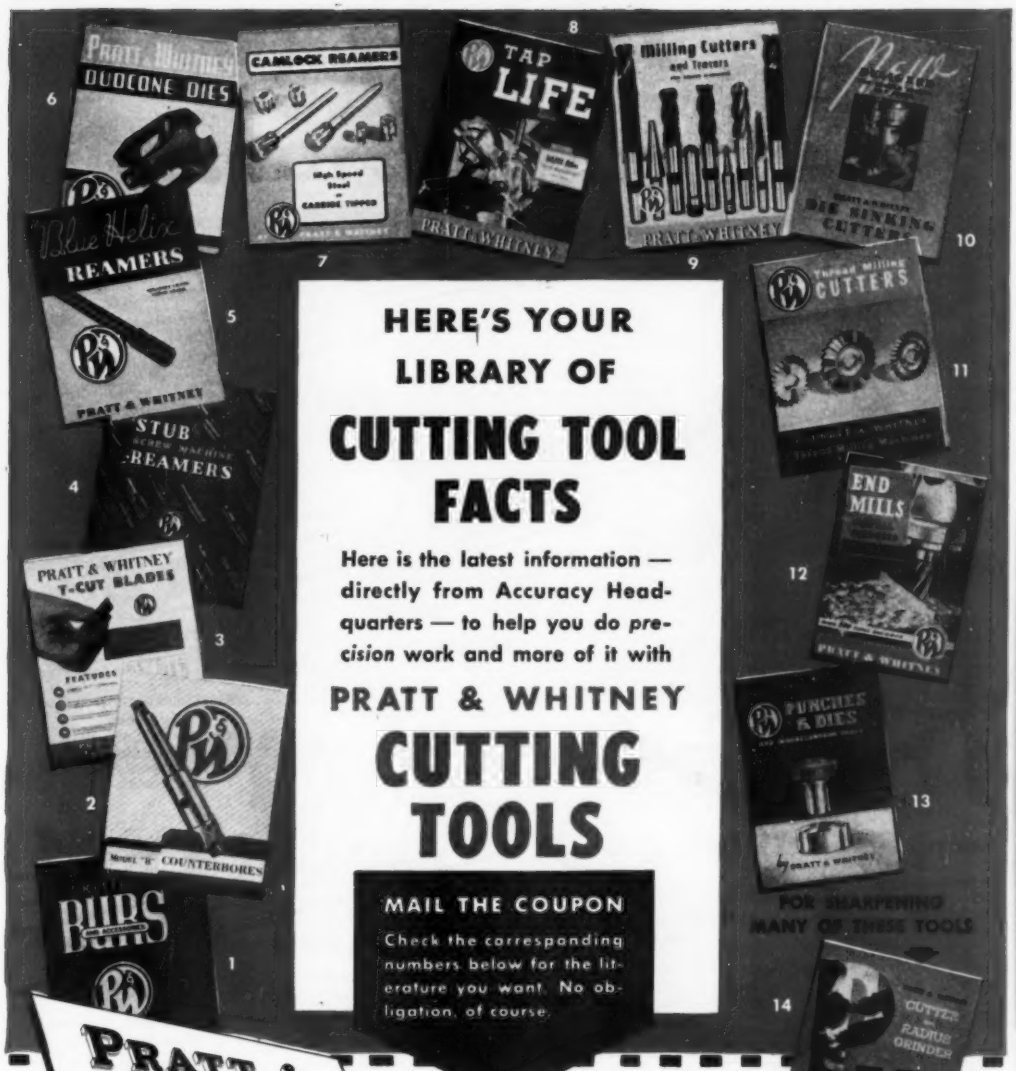

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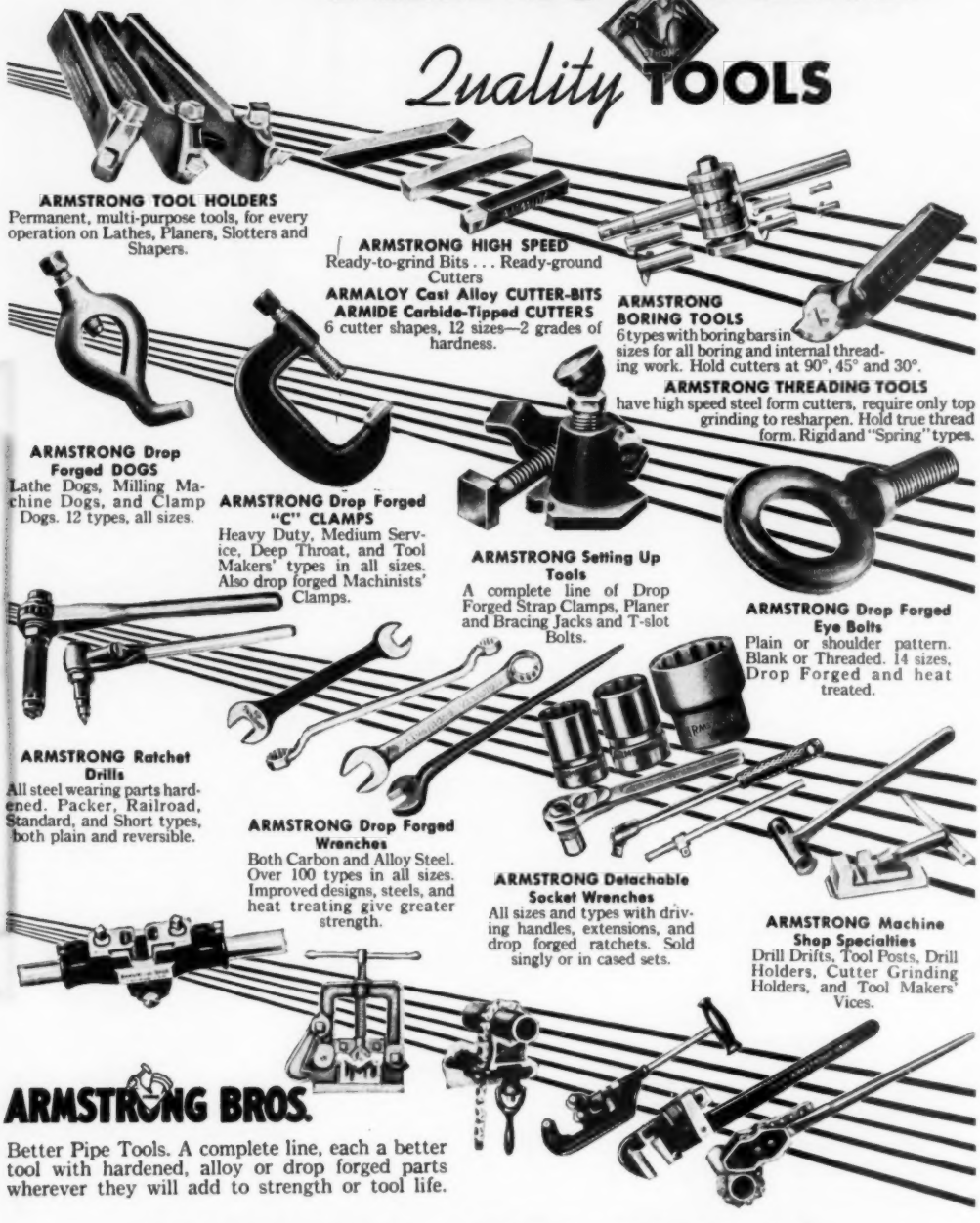
ARMSTRONG

Quality TOOLS



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Permanent, multi-purpose tools, for every operation on Lathes, Planers, Slotters and Shapers.

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6 cutter shapes, 12 sizes—2 grades of hardness.

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6 types with boring bars in sizes for all boring and internal threading work. Hold cutters at 90°, 45° and 30°.

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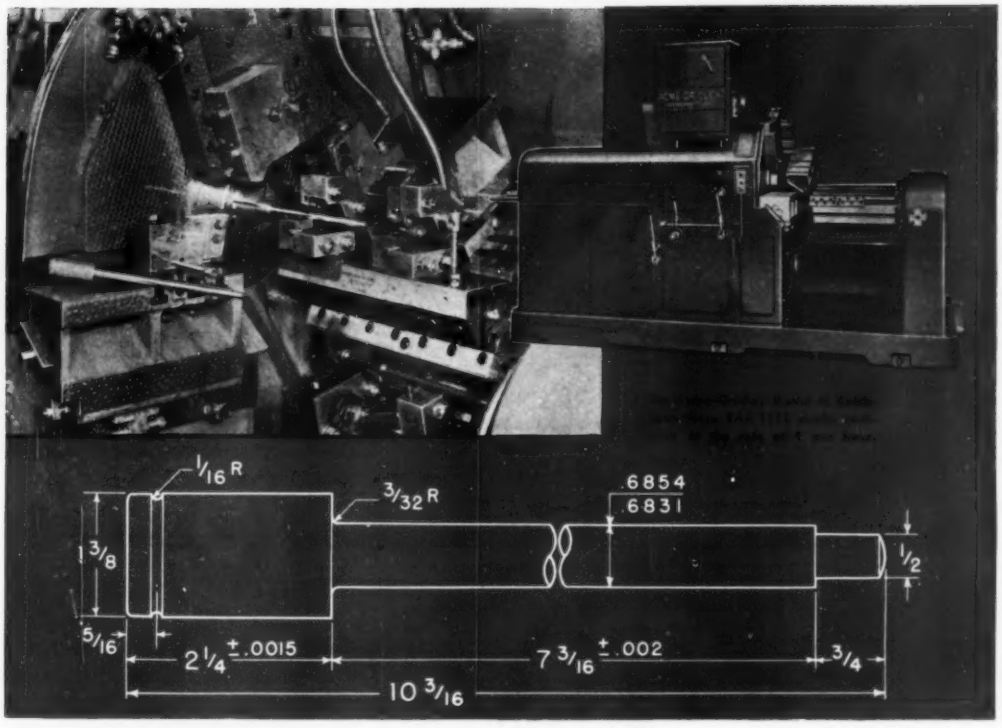

THREE TIMES FASTER

—with fine finish and close tolerances

ALL ON AN ACME-GRIDLEY MODEL M AUTOMATIC

Turning long diameters to close tolerances can be tricky—but the new Acme-Gridley Single Spindle Model M Automatic takes exacting jobs like this in stride.

Its wide, open tooling zone and rugged frame are ideal for the special tooling such work requires. In the case-study illustrated, for example, there's plenty of room for the special independent accelerated drive used to get fine finish, and for the roller supports that help preserve close tolerance. Frame strength adequate for high-speed or carbide tools contributes to production records like this three-times-faster performance of nine shafts per hour.

There are other production-increasing advantages, too: eight independently operated tool slides and three ranges of automatic spindle speeds permit the use of the best speeds and feeds for each cut.

Ask for production estimates on your jobs.

Acme-Gridley Model M Automatics are built in three capacities: 3½", 4½" and 5½". For complete information ask for Bulletin M-50.

Machine obsolescence is the creeping paralysis that strangles profits.

The NATIONAL ACME CO.

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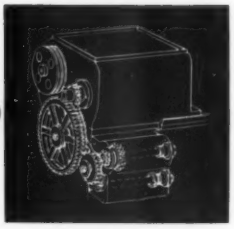
Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog-Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing

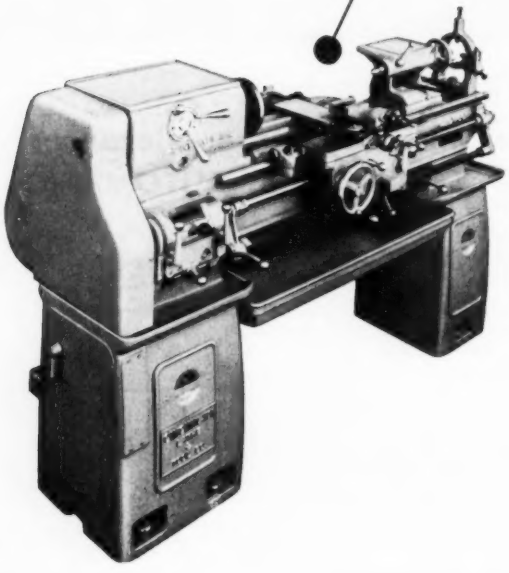
quick change artist



Reposition just 3 parts

Set up only two additional gears

from English to metric thread-chasing in about ten minutes*



Simple straightforward steps arrange your Tray-Top light duty engine lathe to cut a full range of 48 metric threads and carriage feeds through the standard quick change box . . . quicker by far than for any other lathe, and more economical, too . . . What's more, you can change any of 12 spindle speeds (all geared, 40 to 1 overall ratio) in an instant, with 3-lever direct-reading color-match speed selector . . . And you can change setups because parking spaces on top of headstock and tailstock put mikes, tools, etc., at operator's fingertips, right where needed.

Your Tray-Tops are indeed quick change artists. Operators spend no time figuring, more time getting work out. Make your next light duty lathe a Tray-Top.

***required for many defense items.**

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OF OUTSTANDING VALUE

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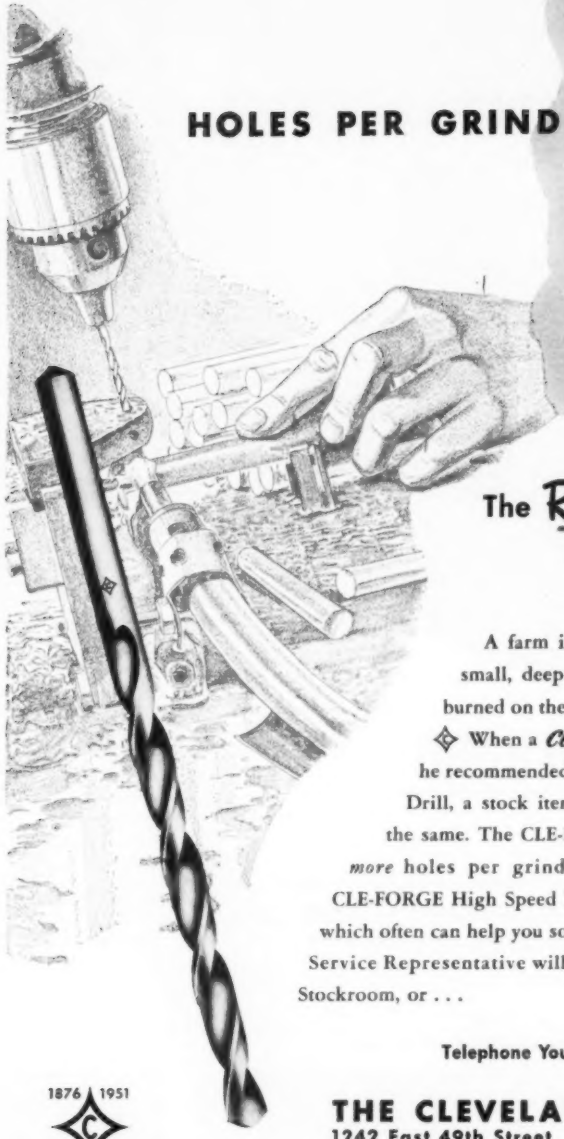

HOLES PER GRIND *increased from 8 to 83!*

The *Right* CLE-FORGE stock drill gives spectacular performance

A farm implement manufacturer had trouble drilling small, deep holes in a 1019 steel shaft. Regular drills burned on the corners and gave only 3 to 8 holes per grind. When a *Cleveland* Service Representative was called in, he recommended the special purpose CLE-FORGE High Speed Drill, a stock item, illustrated here. Speed and feed remained the same. The CLE-FORGE High Speed Drills averages *ten times more* holes per grind! There are several special purpose CLE-FORGE High Speed Drills, regularly stocked by your Distributor, which often can help you solve a difficult drilling problem. A *Cleveland* Service Representative will be glad to advise you. Contact our nearest Stockroom, or . . .

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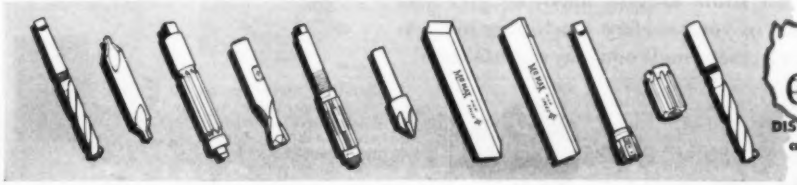
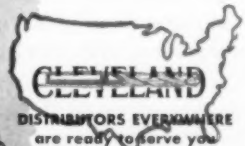
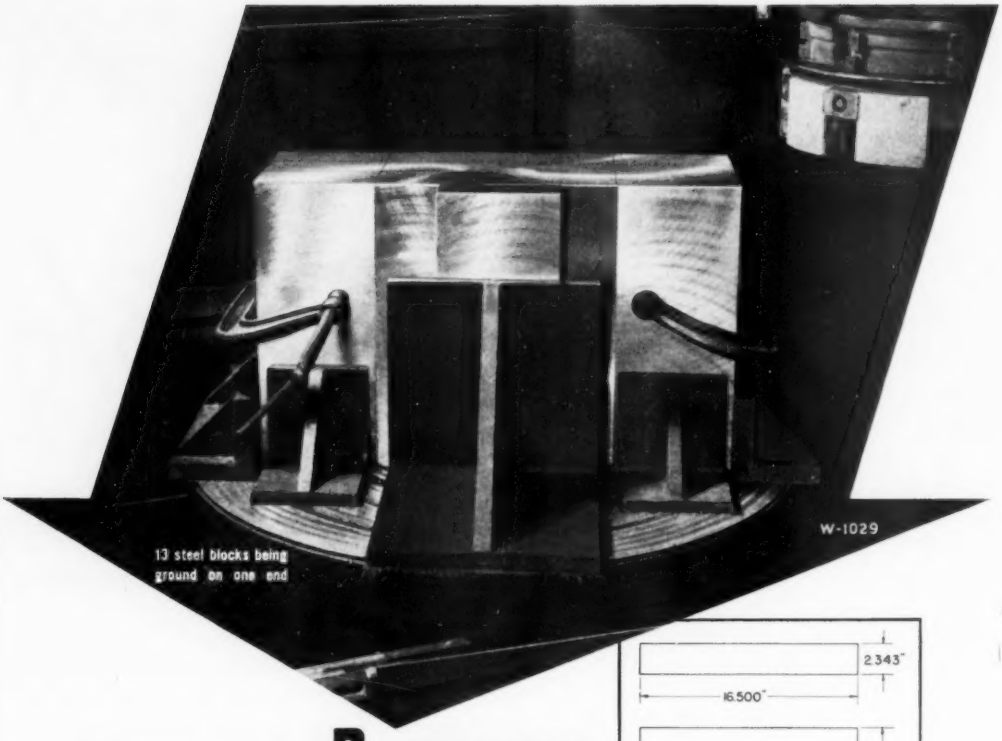
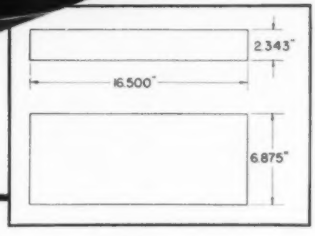




ASK YOUR INDUSTRIAL SUPPLY DISTRIBUTOR FOR THESE AND OTHER *Cleveland* TOOLS





Put it on the BLANCHARD

√. . . for stock removal

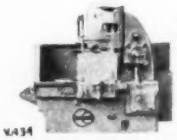
These annealed steel blocks were ground on all 6 surfaces on a Blanchard No. 18 Surface Grinder. Rough size was 16¾" x 7⅛" x 2½". *37.439 lbs. of metal were removed from each piece!*

√. . . for speed

Thirty of these steel blocks were ground on all 6 surfaces in 42½ hours. *This is a floor-to-floor time of only 85 minutes each.* All surfaces were ground square within .002", and flat and parallel.

√. . . for comparison

Let Blanchard grind some sample parts, or give you estimates from prints of your surface machining jobs. A comparison with your present methods may surprise you!

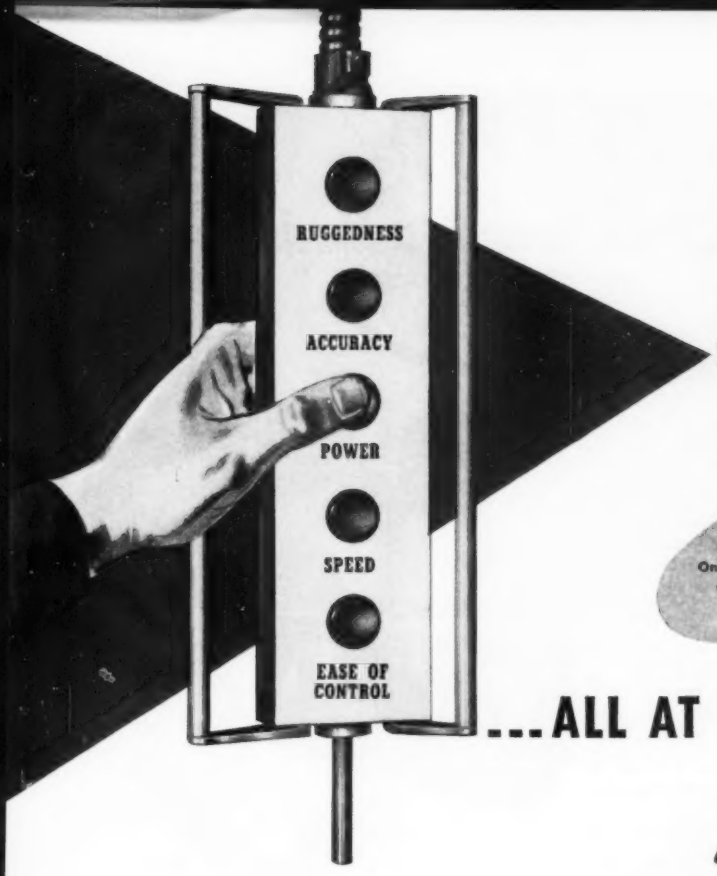


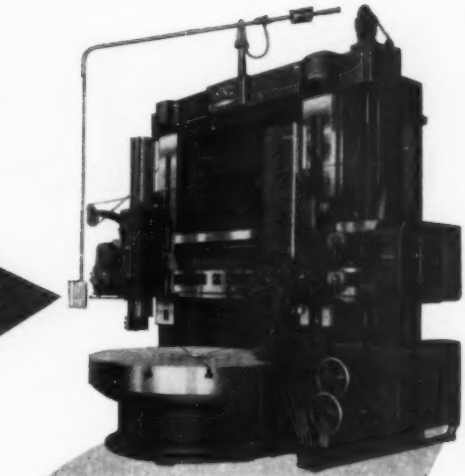
NO. 18 BLANCHARD SURFACE GRINDER

Send for your free copies of "Work Done on the Blanchard," fourth edition, and "Art of Blanchard Surface Grinding."

PUT IT ON THE **BLANCHARD**

THE BLANCHARD MACHINE COMPANY **64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.**





84" KING Vertical Boring & Turning Machine. One of 10 sizes available in a wide variety of head combinations.

...ALL AT YOUR COMMAND

WITH A

New Series

KING

10 Sizes

King machines are made in 10 sizes—Single Column: 30", 36", 42"; Double Column: 52", 62", 72", 84", 100", 120", 144". All sizes available in a wide variety of head combinations, with or without side head.

Husky New-Series KING Vertical Boring & Turning Machines put *extra* power, *extra* precision, and an *extra* wide range of feeds and speeds right where they belong — at your operator's fingertips.

The bigger and more urgent your production requirements, the more it will pay you to consult a KING engineer.

WRITE FOR CATALOGS

Catalog K-1 features machines sizes 30", 36", and 42"; K-2 sizes 52", 62", and 72"; K-3 sizes 84" and 100"; K-4 sizes 120" and 144". Specify machine sizes in which you are interested.

American Steel Foundries

KING MACHINE TOOL DIVISION

CINCINNATI 29, OHIO

Builders of King Vertical Boring & Turning Machines and Sebastian Lathes

M.T.

When Does a Band Saw Become a Machine Tool?

There are basic requirements of accuracy and proficiency that separate a "machine tool" from other power tools . . . characteristics such as those which distinguish a tool maker's screw-cutting, precision lathe from the woodworking lathes used in grade school manual training classes. Among metal-cutting band saws, only the MARVEL No. 8 Series Band Saws can qualify as *machine tools*, for only MARVEL Band Saws have the following capabilities and features:

1 Angular cutting from 0° to 45° right or left *without* moving the work. Built-in protractor.

2 Vertical blade power-fed into material—permits re-entrant cuts, notching, mitering, keyway sawing, etc.

3 Automatic power or manual feeds at the flick of a finger.

4 Feed pressure adjustable even when machine is running. Indicated in actual pounds of pressure.

5 Work clamped to table of machine. Working area more than 835 square inches.

6 Tee-slotted table facilitating clamping down of odd and irregular shaped pieces; easily supports heavy work or large and long structural shapes. Standard vise chucks work on either side of blade.

7 Automatic blade tensioning device. Every blade at uniform tension regardless of operating efficiency.

8 Adjustable upper guide roller holder insuring minimum section of unsupported blade on all sizes of material. Quick acting.

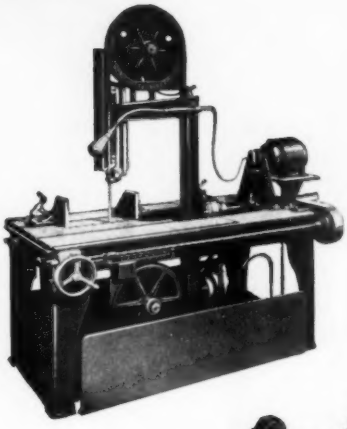
9 Built-in coolant system with delivery at blade entry point. Pump driven without belt or gears.

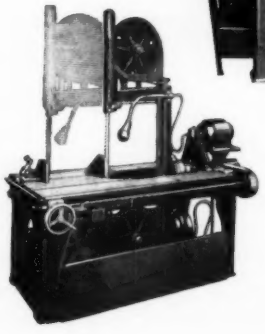
10 Replaceable vise ratchet and table wear strips of tool steel. New saw performance at all times.

11 LARGE CAPACITY: Standard: 19½" x 18¾". High column: 25½" x 18¾". Handles 99% of all work.

Before buying any metal-cutting band saw, be sure to see the versatile MARVEL No. 8. Your local MARVEL Field Engineer will demonstrate its significant "machine tool" characteristics and their application to your work, with costs, savings, cutting speeds and methods. This technical service is provided, without obligation, in the interests of better metal sawing.

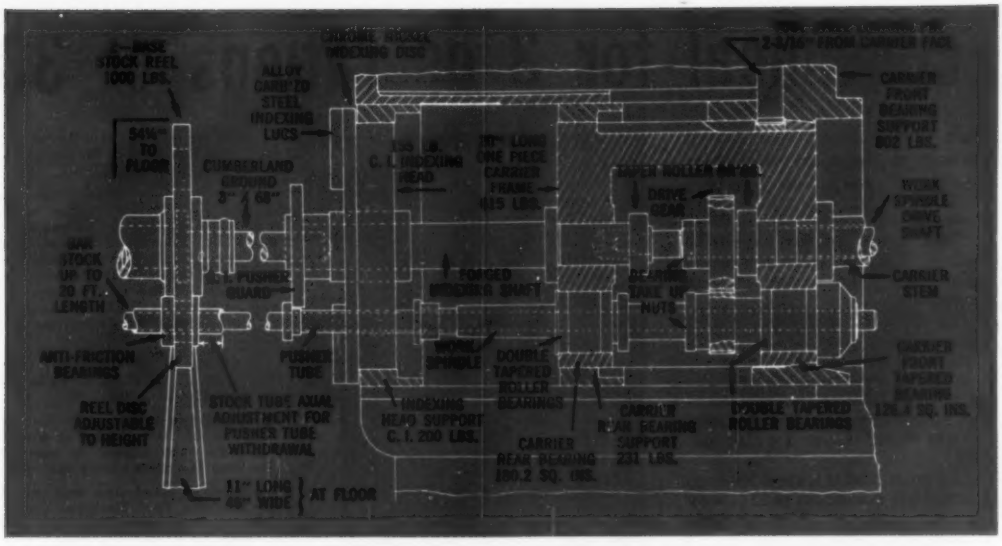
If you prefer to "study it out for yourself," write for the MARVEL C-49 Catalog.





ARMSTRONG-BLUM MFG. CO.
5700 Bloomingdale Ave. Chicago, USA

MARVEL Metal Cutting SAWS
Better Machines—Better Blades


BASE STOCK REEL 1000 LBS.
ALLOY CARB'ZD STEEL INDEXING LUGS
CHROME NICKEL INDEXING DISC
54½" TO FLOOR
CUMBERLAND GROUND 3" x 68"
C.I. INDEXING HEAD
FORGED BROACH SHAFT
DRIVE GEAR
CARRIER FRONT BEARING SUPPORT 802 LBS.
WORK SPINDLE DRIVE SHAFT
CARRIER STEM
BAR STOCK UP TO 20 FT. LENGTH
C.I. PUSHER GUARD
ANTI-FRICTION BEARINGS
PUSHER TUBE
WORK SPINDLE
DOUBLE TAPERED ROLLER BEARINGS
REEL DISC ADJUSTABLE TO HEIGHT
STOCK TUBE AXIAL ADJUSTMENT FOR PUSHER TUBE WITHDRAWAL
INDEXING HEAD SUPPORT C. I. 200 LBS.
CARRIER REAR BEARING 280.2 SQ. INS.
CARRIER REAR BEARING SUPPORT 231 LBS.
DOUBLE TAPERED ROLLER BEARINGS
CARRIER FRONT TAPERED BEARING 128.4 SQ. INS.
11" LONG 40" WIDE AT FLOOR

FIRST THINGS COME FIRST

Upon the Spindle Carrier of an "Automatic" falls the responsibility of accurately presenting and holding the work to — and in contact with — the tools. The basic design of the Carrier is obviously of first importance in the protection of the work spindles from the strain of heavy cuts and weight of the bar stock. Then, in proportion to the Carrier's ability to handle the full load is the importance of any supplementary facility that shares the load.

1. **The 1½" Six Spindle CONOMATIC CARRIER gives better support to the work spindles under heavy loads.**

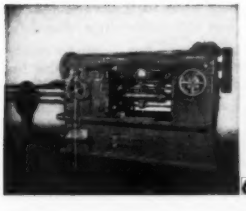
   The thick, heavy ribs resist strain. The tapered front bearing and the spindle drive gears are within 3" and 9¼", respectively, of the collet faces. The wider spaced bearings give better alignment and load distribution. The Carrier is free of Cross Slide positive stop pressure.

2. **The entire INDEXING MECHANISM is supported by the Top Bed as well as the Base. There are fewer wearing parts.**

   The Indexing Head takes the brunt of the indexing load. It is supported by the short frame member midway between the Carrier and the Stock Reel. It is joined to the latter by strong center shafts.

3. **The STOCK REEL is designed to handle longer and heavier loads.**

   The two Stock Reel Bases are independent of the machine and relieve it of the heaviest part of the bar load during the cutting and indexing movements. Adjustable alignment gives freer stock-feed action.



Buyer's Comparison Chart will guide you to full information

A Comparison of ALL Automatics is in Favor of Cone

Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

Economical for 3 operations or 33

High production of these 2 drilling & tapping machines cuts unit costs to pennies

Dear Sir:

These machines need expensive tooling. Yet unit costs are amazingly low. The reason is high production.

The oil heater part has 33 operations from 6 directions. Three units at compound angles move forward to operate and then retract so that the fixture can index. Ten identical double fixtures hold 2 parts each. Cost: 1-8/10c per part.

The conn. rod is a steel forging. The milling operation is 42° away from the drilling. The machine grosses 590 parts an hour by 1) holding 2 parts in each fixture and 2) drilling the .125 hole in 2 steps (50.5 FPM). Cost: 9/10c per part.

These costs include man and machine on this basis: National average wage rate. 80% efficiency. Amortize the whole machine cost over its first 6000 hours. (No power or overhead.)

AN OLD STORY

Such low unit costs are old stuff to many high production men. They figure that certain automatic machines can pay for themselves in 1 to 3 years. That is why they buy them. General purpose equipment can do the operations, but the cost is too high. They can move it to one side and install automatic machines with space left over.

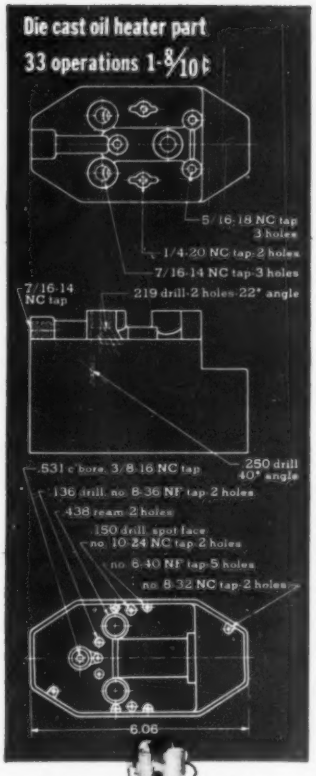
A NEW STORY

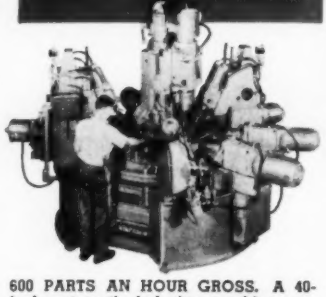
Speaking of installation, here is a remark by one production official. Ten Kingsburys had just arrived. By noon 5 of them were in production. "You know why I like Kingsburys? They run." (He ought to know. Since the war that plant has installed 46 Kingsburys costing $689,204.)

Don't let this bragging scare you. At first most firms ask us to quote only 1 or 2 machines. We will be glad to settle for that. Mr. L. A. Carll is the man to ask. Send him a print showing the operations and hourly output you need. Or ask him for free bulletins showing 40 setups.

Sincerely,

Kingsbury Machine Tool Corp.
10 Laurel St., Keene, N. H.


Die cast oil heater part
33 operations 1-8/10¢
5/16-18 NC tap 3 holes
1/4-20 NC tap-2 holes
7/16-14 NC tap-3 holes
7/16-14 NC tap
219 drill-2 holes-22° angle
.531 c'bore, 3/8-16 NC tap
.250 drill 40° angle
.136 drill, no. 8-36 NF tap-2 holes
.438 ream-2 holes
.150 drill, spot face no. 10-24 NC tap-2 holes
no. 6-40 NF tap-5 holes
no. 8-32 NC tap-2 holes
6.06

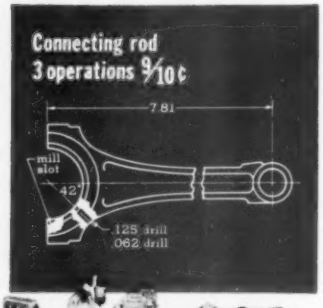


600 PARTS AN HOUR GROSS. A 40-inch automatic indexing machine performs operations from 6 directions in 2 chuckings. It has 12 automatic units — 7 on the base, 3 on angular columns and 2 on the central column.

- The horizontal units use multi-spindle heads to operate on the 14 holes in the bottom view (1st chucking) and tap 7/16-14 in the center view (2nd chucking).
- The units on the angular columns operate in 4 steps: 1) The whole unit moves forward by means of an airdraulic cylinder that the feed cam controls: 2) The plate with the tool guide bushing is inserted into the work: 3) The unit performs its automatic cycle: 4) The unit retracts so the fixtures can index. Time: 3.75 secs.
- The vertical units use multi-spindle heads to tap the 8 holes in the top view (2nd chucking).
- Clamping is automatic. In the first chucking an air cylinder at station 1 clamps each fixture. In the 2nd chucking the units clamp the work.
- Control is all-electric and meets the Machine Tool Electrical Standards for Automotive Use. The controls are in a separate NEMA type 1A cabinet that stands near the machine (not shown).

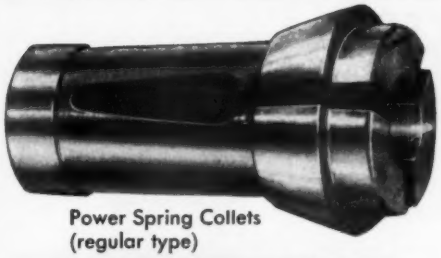
KINGSBURY

AUTOMATIC DRILLING
AND TAPPING MACHINES
for Low-Cost High Production

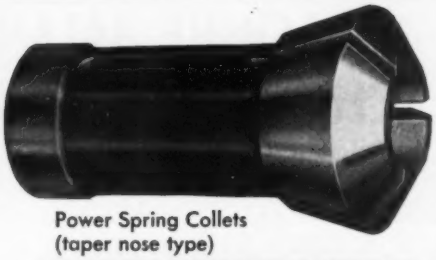


590 PARTS AN HOUR GROSS. To meet this rate with a steel forging, each fixture holds 2 parts. Each time the table indexes, 2 parts are finished. Two units drill the .125 hole in 2 steps to keep that operation within the allowed cycle.

- The fixtures are automatically clamped and unclamped as the table indexes.
- The milling units are on the radial center line of the machine. The drilling units are 42° left of this line.
- There are 6 identical double fixtures on a 20-inch index table.
- Drilling units with standard milling attachments mill the slot.

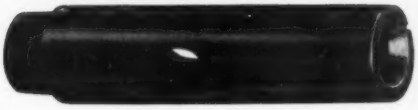


Power Spring Collets
(regular type)



Power Spring Collets
(taper nose type)

Feed Fingers (regular type)



Master Feed Fingers and Pads

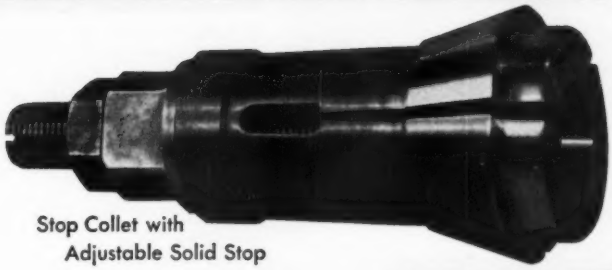
Master Feed Fingers
with Adjustable Tension

HARDINGE
ELMIRA, N.Y.

PRECISION PRODUCTS
for BROWN & SHARPE machines

For maximum production efficiency, specify Hardinge precision products for your Brown & Sharpe Automatics and Wire Feed Screw Machines. Reduce tooling costs and step up production with these and other Hardinge precision products engineered, customer-shop tested, and approved for Brown & Sharpe machines. Write for Catalog 36 — contains complete descriptions, specifications, and ordering information.

Deliveries from stock



Stop Collet with
Adjustable Solid Stop

Stop Collet with
Adjustable Spring Ejector Stop

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

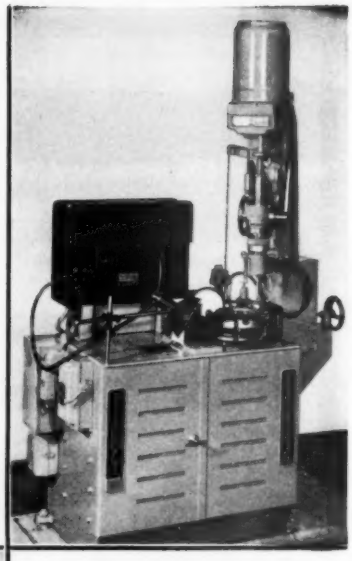
"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

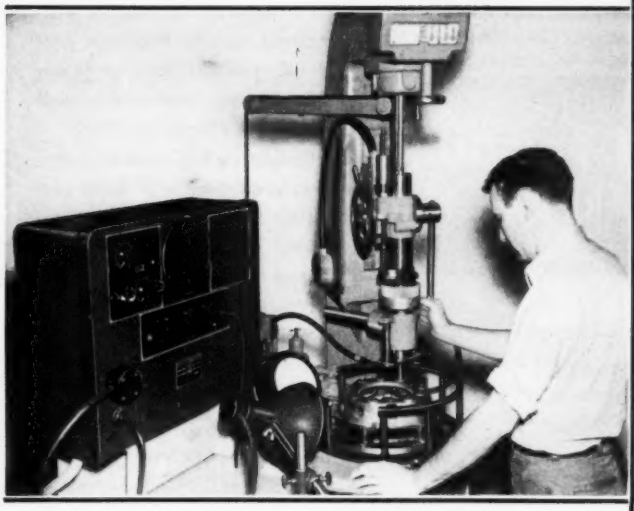
Offices in principal cities. Export office 269 Lafayette St., New York 12, N. Y.

MACHINE BALANCES CLUTCH ASSEMBLIES!

Phenomenal speed and accuracy are achieved with the Gisholt machine which performs all four steps in the complete balancing operation as follows: (1) locates unbalance, (2) measures unbalance, (3) corrects unbalance, (4) checks balance. Designed especially for this work, the machine handles operations at the rate of 80 pieces per hour.

Gisholt ISV Dynetric Balancer

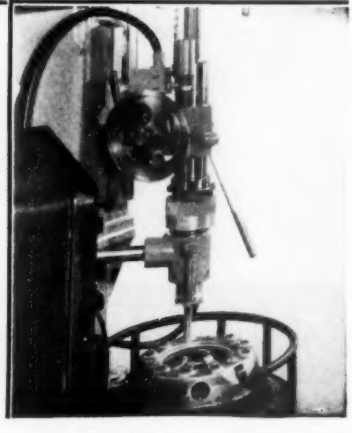




Saves handling time
With correction drill incorporated as a part of the machine, it is unnecessary to remove work piece from mounting for drilling. Handling time is cut to a minimum.

Corrections clearly indicated
Readings clearly show where and how much metal is to be removed in units of drill depth. All chips are automatically ejected so they cannot get caught in the clutch pressure springs.

Insures better service Whether it's in production or repair work, the balancing of clutch plate assemblies is of little avail unless it is done *accurately.* And here, again, the DYNETRIC principle provides the accuracy which makes Gisholt the unquestioned leader in the field of balancing. Full information on request.



GISHOLT MACHINE COMPANY
Beautiful Madison, Wisconsin

DYNETRIC BALANCERS — GISHOLT — DEVELOPED JOINTLY WITH WESTINGHOUSE ELECTRIC CORPORATION. "DYNETRIC" IS A TRADE MARK REG. U. S. PAT. OFFICE BY WESTINGHOUSE ELECTRIC CORPORATION

TURRET LATHES • AUTOMATIC LATHES
BALANCERS • SUPERFINISHERS • SPECIAL MACHINES

Century 1 TO 400 H.P. MOTORS

Choose From These Many Types To Fit Your Job

DEPENDABLE CONSTRUCTION . . . Plus

PROPER SELECTION MINIMIZE SHUTDOWNS

Century Electric Company is celebrating its 50th year in the electrical industry.

It's easy to select the proper electric motor for your job from Century's complete line — from 1/6 to 400 horsepower. A wide range of types and kinds are available to satisfy all popular requirements. They are carefully designed, built and tested to assure maximum performance throughout their long life.

Here are examples of Century's line of INTEGRAL HORSEPOWER motors.

Polyphase

TYPE SC—Open Drip proof General Purpose Motor. Meets the needs of most installations where operating conditions are relatively clean and dry.

TYPE SC—Splash proof. Supplies protection where plants must be washed down. Keeps out all falling or splashing liquids—rain, snow, sleet, etc.

TYPE SC—Totally Enclosed Fan Cooled. Protects against dusts, mist, oil, fog. Inner frame protects vital parts of the motor, seals out harmful matter.

TYPE SC—Explosion proof. Protects life and property in atmospheres charged with explosive dusts or gases.

TYPE SR—Wound Rotor. Open Construction. Ideal for applications requiring low starting current with high starting torque, reversing or adjustable speed.

TYPE SR—Wound Rotor Splash proof. Same electrical characteristics as motor shown above. In addition, gives adequate protection against falling and splashing liquids.

Single Phase

TYPE RS—Repulsion Start Induction, Open Construction, Single Phase Brush Lifting Motor. Combines high starting torque with low starting current.

TYPE RS—Splash proof. Same advantages as open construction, plus protection against splashing and falling liquids.

TYPE CSH—Capacitor Start Induction, Single Phase Motor. Suitable when high starting torque with normal starting current is satisfactory.

TYPE CSH—Splash proof. Same advantages as motor shown above, plus protection against falling and splashing liquids.

Direct Current

TYPE DN—Direct Current Motors. Suitable for use where direct current is available, or its use desirable.

TYPE DN—Direct Current, Splash proof.

TYPE SY—Synchronous. Suitable for continuous operation at a uniform load for power factor correction.

In addition to a complete line of integral horsepower motors, Century offers fractional horsepower motors, gear motors, generators, AC and DC motor generator sets.

683

For a long life of satisfactory performance, specify Century motors for all your electric power requirements.

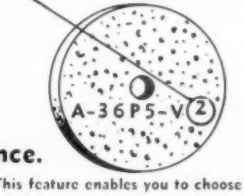
CENTURY ELECTRIC COMPANY, 1806 Pine Street, St. Louis 3, Missouri • Offices and Stock Points in Principal Cities

HARDNESS GRADE DUPLICATION ASSURED

Grinding wheels when tapped by a solid object produce definite musical tones. Every tone or "ring" can be scientifically registered and translated into degrees of hardness. This modern application of physics is utilized to accurately check grinding wheel grade hardness . . . one more important step forward by BAY STATE to more closely duplicate your wheels from order to order.

FRACTIONAL GRADES
(Exclusively Bay State)

1 = ⅓ GRADE SOFT
2 = EXACT GRADE
3 = ⅓ GRADE HARD



This feature enables you to choose the exact degree of hardness desired by splitting every normal grade into three degrees of hardness, where a whole grade change would be too great.

ADVANCTAGES:

- Customer time saver.
- Consistent maximum performance.
- Greater economy.
- Repeat orders duplicated.
- Faster delivery.
- Less trial testing.

BAY STATE®

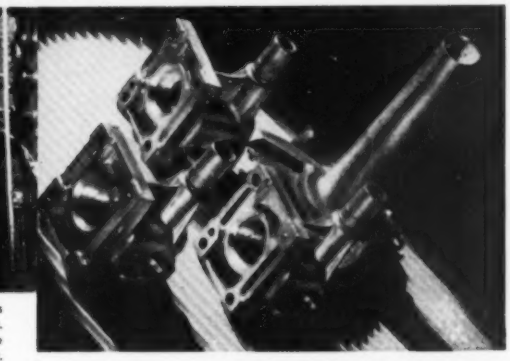
BAY STATE ABRASIVE PRODUCTS CO., Westboro, Mass.
Chicago, Cleveland, Detroit, Pittsburgh • Distributors All Principal Cities

Top Performance Consistently Duplicated

If you're considering new die casting machinery...

why not profit from the experience of others?

One of a battery of 5 Model 400 Clevelands in operation in the modern plant of the St. Louis Die Casting Corp., St. Louis, Mo. The operator is removing the casting shown at right.



ST. LOUIS DIE CASTING CORP. *gets better castings, faster, at less cost* WITH CLEVELAND MODEL 400's

These three examples are typical of the production —*around the clock*—that experienced die casters are getting from Cleveland Die Casting Machines. You too can get better castings, faster, at less cost, with Clevelands.

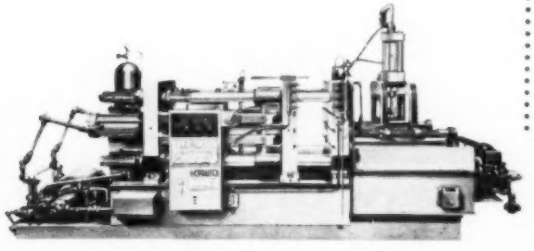
Let a Cleveland engineer show you *further proof* of the advantages these machines can bring to your die casting production. For complete information on machine specifications, write now for bulletins.

340 SHOTS PER HOUR!
Weight of metal per shot 14.35 oz. Weight per piece 4.6 oz.

Zinc fan gear case casting from two-cavity die with movable cores. Most of the cored holes required no further finishing. Three critical dimensions are held to ± .001" tolerance. Each casting receives a careful spot check, and at time photo was taken, 170,000 castings had been produced without a single reject.

325 SHOTS PER HOUR!
Weight of metal per shot 3.3 lbs. Weight per piece 4.75 oz. Zinc nuts cast from 8-cavity die.

375 SHOTS PER HOUR!
Weight of metal per shot 1.15 lbs. Weight per piece 1.8 oz. Zinc nobs for electric control panel cast from 6-cavity die.



Cleveland Model 400 Universal High-Pressure Hydraulic Die Casting Machine for zinc, tin or lead. Hot metal end can be easily changed to convert to cold chamber machine. 36" x 38" die plates. Approx. 800,000 lbs. locking pressure.

THE CLEVELAND AUTOMATIC MACHINE COMPANY

4928 Beech Street
Cincinnati 12, Ohio

SALES OFFICES: CHICAGO
CLEVELAND • DETROIT
HARTFORD • NEWARK

Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

The sleeper that took the 12 noon plane

Would you have been caught napping in a situation like this?

Suppose you were in the fashion business. You have just created a line of women's nightgowns that are going to be given an unexpected publicity break in some top national magazines. This will mean more sales all over the country. But you must get more merchandise to the stores in a hurry – or forever lose your golden chance to get sales.

What would *YOU* do?

This happened to one company recently – but the problem caused them to lose no sleep. Faced with this situation at 10:30 A.M. they were able to start goods flowing to the stores on planes that left at noon.

The answer was Air Express!

But you don't have to be in the fashion business to profit from the regular use of Air Express. Here are its unique advantages which any business can enjoy:

IT'S FASTEST – Air Express gives the fastest, most complete door-to-door pick up and delivery service in all cities and principal towns, *at no extra cost.*

IT'S MORE CONVENIENT – One call to Air Express Division of the Railway Express Agency, arranges everything.

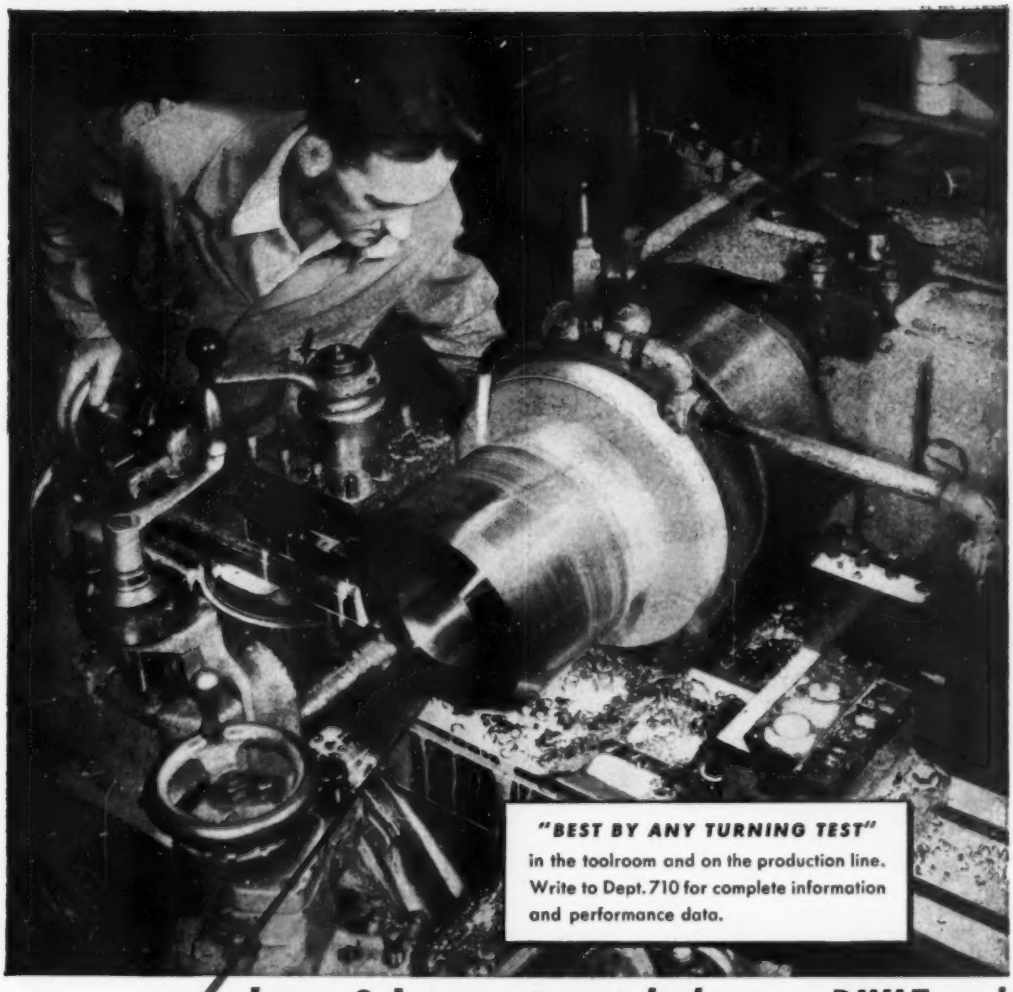
IT'S DEPENDABLE – Air Express provides one-carrier responsibility all the way and gets a *receipt upon delivery.*

IT'S PROFITABLE – Air Express expands profit-making opportunities in distribution and merchandising.

For more facts call Air Express division of Railway Express Agency.

AIR EXPRESS

GETS THERE FIRST


"BEST BY ANY TURNING TEST"
in the toolroom and on the production line.
Write to Dept. 710 for complete information
and performance data.

Jones & Lamson turret lathes are BUILT and

POWERED TO PRODUCE

MORE CHIPS **per tool**
MORE PIECES **per hour**
MORE PROFIT **per job . . . than any turret lathe of comparable size!**

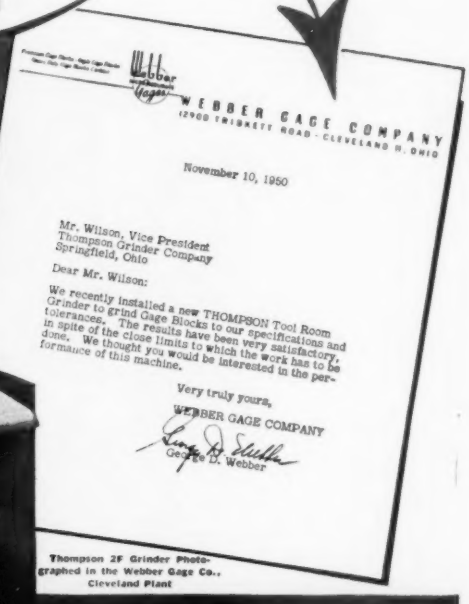
Turret Lathe Division **JONES & LAMSON** MACHINE COMPANY
Springfield, Vermont, U.S.A.
MACHINE TOOL CRAFTSMEN SINCE 1835

Here's Proof

The New Thompson Type 2F is a

SUPER PRECISION

Tool Room Grinder



WEBBER GAGE COMPANY
12900 TRISKETT ROAD · CLEVELAND 11, OHIO

November 10, 1950

Mr. Wilson, Vice President
Thompson Grinder Company
Springfield, Ohio

Dear Mr. Wilson:

We recently installed a new THOMPSON Tool Room Grinder to grind Gage Blocks to our specifications and tolerances. The results have been very satisfactory, in spite of the close limits to which the work has to be done. We thought you would be interested in the performance of this machine.

Very truly yours,

WEBBER GAGE COMPANY

George D. Webber

Thompson 2F Grinder Photographed in the Webber Gage Co., Cleveland Plant

COMPARE THIS NEW 8 x 10 x 24 TOOL ROOM GRINDER

When working to a tolerance of four millionths of an inch such as is observed when making Webber Gage Blocks, the rough or preliminary grinding plays an important role in keeping cost of the final finishing within reasonable limits.

Compare These Features:

- HARDENED AND GROUND cross slide ways completely sealed.
- One shot lubrication to cross slide ways and internal saddle bearings.
- HARDENED AND GROUND sealed anti-friction vertical slide.
- HARDENED AND GROUND BED WAYS with automatic lubrication.
- 3600/1800 R.P.M. 2 speed wheel head. Heavy alloy steel spindle heat treated, runs in super precision ball bearings accurately preloaded, lifetime lubricated.

Handy control panel.

- Elevation micrometer stop graduated in .0001".
- GROUND THREAD FEED SCREW.
- Automatic wheel TRUING device.
- Longitudinal hand wheel with automatic engagement.
- Hydraulic head movement throttle with rapid traverse.
- Hydraulic table movement throttle.
- Elevating hand wheel graduated in .0005".
- GROUND THREAD FEED SCREW.

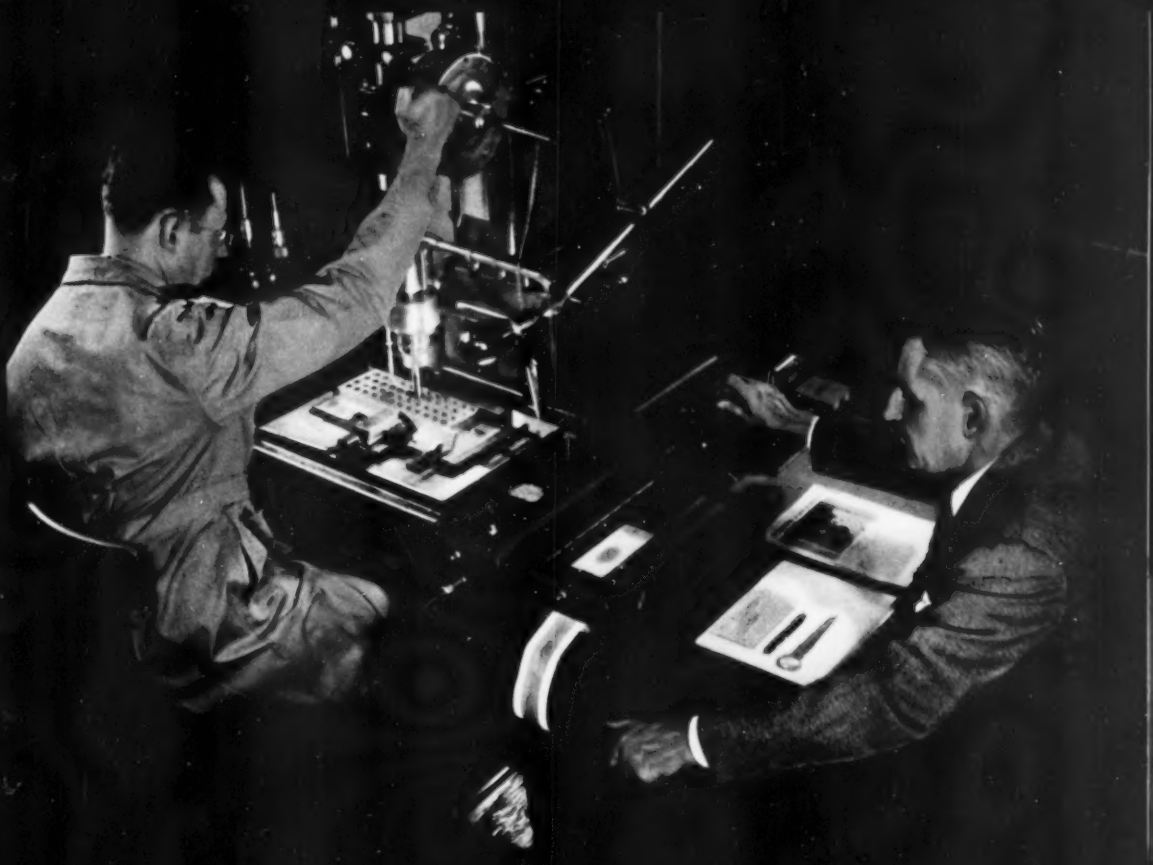
WRITE TODAY for complete specifications and performance data. Address Dept. 10, Thompson Grinder Co., Springfield, Ohio.

COPYRIGHT 1951 BY THE THOMPSON GRINDER CO.

The only manufacturer of a complete range of heavy duty and light duty surface and contour grinders for industry.

Thompson SURFACE Grinders

The Thompson Grinder Company, Springfield, Ohio



Why GTD Greenfield?

These men know what a tap will do *before* it does it. They are experts in tap torque testing. At "Greenfield's" research laboratory, torque tests are permanently recorded on oscillograms by the electronic torque meter. Careful study of the torque records provides the basis for continuing tap improvement.

The big three in "Greenfield's" program — careful research, engineering developments, better manufacturing techniques — have made "Greenfield" leaders in the threading tool field. When you buy "Greenfield," you know you're getting the best today. Tomorrow, "Greenfield's" research and development will make the best *better!*

GREENFIELD TAP AND DIE CORPORATION
Greenfield, Massachusetts

BUY GTD GREENFIELD!

Memo
George--
Can't take any chances with the thread finish on Job #348, so we're recommending GEOMETRIC "D" Self-Opening Die Heads. The boys will be able to get both the roughing and finishing cuts with just one adjustment. Couldn't be easier! Besides, GEOMETRIC'S "D" has plenty of metal backing the chaser cutting points and a lot of chip space in the bore. Looks plenty good to us.
Bill
7" RECESS
8
1.000"
.9902"
3"
32 R
3"
16
3"
16
2 3/8
1 1/4
5"
32
.255"
.250"
16 X 45°
-14 NF 3
P.D. .9536"
.9500"

Greenfield Tap and Die Corporation

NEW HAVEN 15, CONNECTICUT

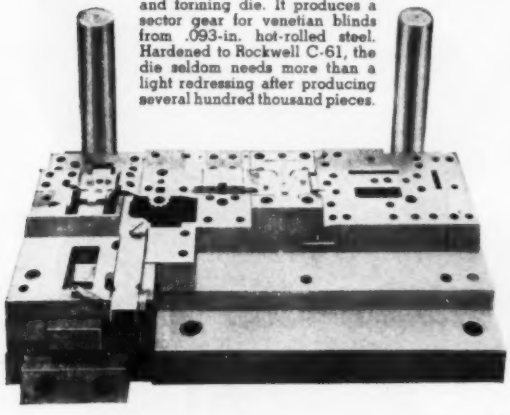
LEHIGH H

HIGH-CARBON, HIGH-CHROMIUM TOOL STEEL

For high-production dies

Photos Courtesy: Middlestadt Machine Co., Baltimore, Md.

Lehigh H is the key to long die life in this seven-stage blanking and forming die. It produces a sector gear for venetian blinds from .093-in. hot-rolled steel. Hardened to Rockwell C-61, the die seldom needs more than a light redressing after producing several hundred thousand pieces.



Here's a tool steel that's engineered for high-production tools and dies. Experienced toolmakers call it the aristocrat among tool steels.

Quick Facts About LEHIGH H

Maximum Wear. Its high-carbon content makes it first choice wherever great resistance to wear is important. Use it for long runs.

Close Tolerances. Lehigh H is the ideal tool steel for maintaining split-hair accuracy. You can count on the very minimum change in size and shape during heat-treatment.

Safe Hardening. Lehigh H is cooled in still air from a hardening temperature of 1850 F. It eliminates cracking hazards for intricate dies, thin sections, short radii.

Heavy Duty. Lehigh H is extremely deep-hardening, even in large sections . . . and has high compressive strength for tools and dies subject to severe service.

Wide Application. Use it for tools and dies that blank, punch, form, draw, shear, and bend . . . for lamination dies, shear blades, wearing plates . . . master gages, bending rolls . . . and the like.

Typical Analysis:	C	Cr	V	Mo
	1.55	11.50	0.40	0.80

A trial in your own shop will convince you. Lehigh H is stocked by Bethlehem Tool Steel distributors in principal cities. The nearest Bethlehem sales office can give you full information.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.
On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation
Export Distributor:
Bethlehem Steel Export Corporation

BETHLEHEM STEEL

Bethlehem ULTRASONIC TESTED **Tool Steel**

WESTINGHOUSE
RESET
Life-Linestarter
PAIRED FOR PRODUCTION
Life-Line motor
WESTINGHOUSE
DO NOT
LUBRICATE

Insure

machine performance with this matched pair

Motors and controls can make or break the performance of your machine tools. Why speculate? Life-Lines assure peak performance under all conditions. Take these, for example:

Accidental blows to starters? Will false operations result? Not with the Life-Linestarter®. Its inverted clapper-type design provides positive operation.

Contact life? Life-Linestarter contacts last longer, why? Because the exclusive "De-ion"® arc quickly divides, confines, and extinguishes the arc. Contacts, therefore never need filing.

Bearing lubrication? Life-Line motors prelubricated, sealed-for-life bearings eliminate this problem. These bearings need no lubrication. And because they are sealed, there's less chance for grit and dust to harm the bearings.

Physical abuse? Falling objects, excessive vibration, corrosive atmospheres—all take a heavy toll of weak motor frames. Thousands of installations have proved that Life-Line's steel frame stands up to physical and chemical abuse better than conventional frames. Steel adds strength without additional weight.

Consider the many other features of this motor and control production team—"paired for performance." Your Westinghouse representative has the facts. Ask him for copies of "Life-Line Motor Book" B-3842 and "Tomorrow's Starter Today" B-4677. Or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

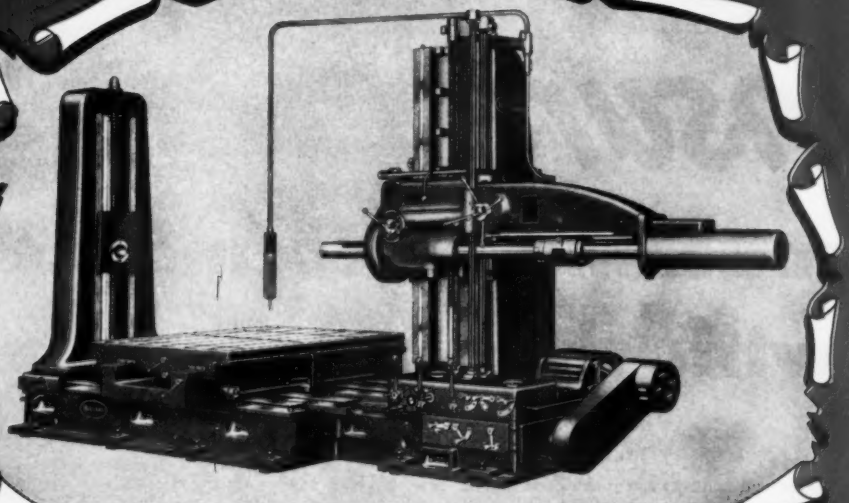
J-21638

YOU CAN BE SURE... IF IT'S Westinghouse

Life-Line

MOTORS and CONTROLS

NOW — 4 WAY Bed Construction



BULLARD

HORIZONTAL BORING MACHINE

In addition to the Bullard 4-way bed construction, other design improvements such as protected bed-ways, non-metallic bearing surfaces under table and saddle, and adjustable nuts for table and saddle feed screws are a few of the improvements that place these 4" and 5" spindle machines on your list for investigation.

Furthermore, don't forget—convenient right hand operation, safety features and hydrodynamic drive.

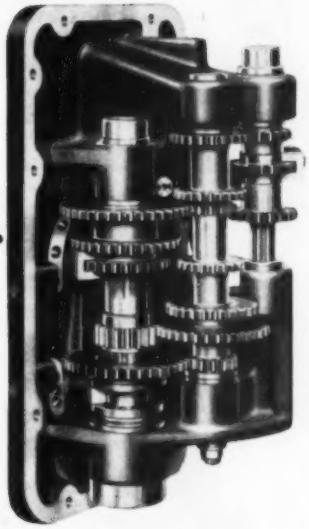
Write Bullard for other details

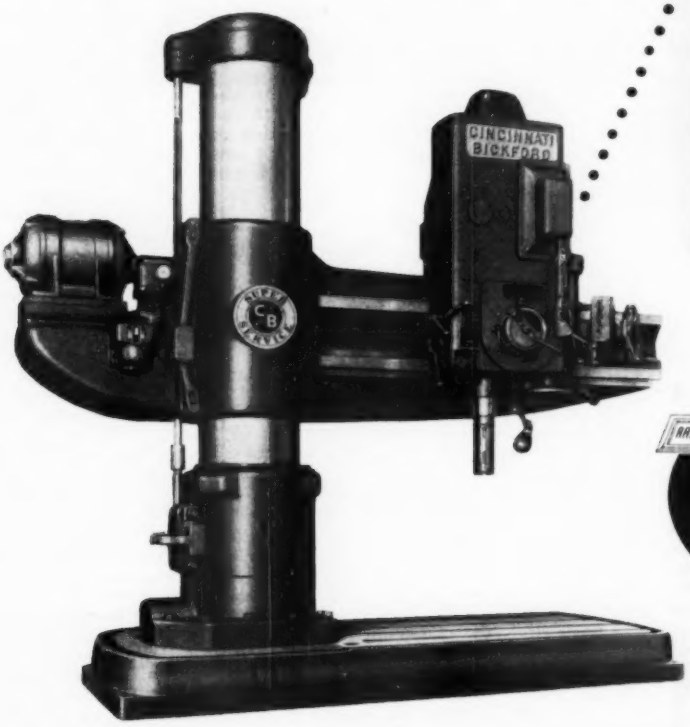
THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT

multiple **splined** *through-out*

This Super Service construction stands out in marked contrast to the previously accepted spring dive-key feed mechanism. The 18 feed changes are made through selective sliding gears, every gear being of heat-treated alloy steel, and every shaft is multiple splined. The superiority of the splined shaft construction is readily seen, with ease of shifting from one feed to another, efficient transmission of power without fear of shearing a key, and lower maintenance cost over long period of time. For further information on the many other patented exclusive features of the SUPER SERVICE RADIAL, write for Booklet R-29.





THE CINCINNATI BICKFORD TOOL CO.
RADIAL AND UPRIGHT DRILLING MACHINES
SUPER SERVICE

Radials 7½" dia. col., 2½" arm, to 26" dia. col., 12' arm.
General purpose Uprights, 21" to 28" sizes.
Production Uprights, 21" to 28"
Jig Borers, Portable Horizontals, Spacing Table Machines

Equal Efficiency of Every Unit Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

TRY THIS *cost-cutting team* **for CARBIDE GRINDING**

Wickman Steel-Bonded Diamond Wheels practically indestructible with extra long life. Diamond particles stay in place until completely worn. Finish tools better for longer tool life.

Wickman Resinoid-Bonded Diamond Wheels for faster and freer carbide cutting and less frequent wheel dressing.

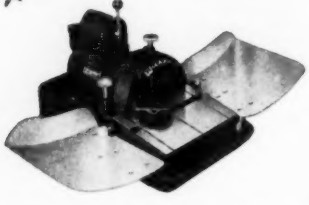
Wickman Chip-Breaker Diamond Wheels steel-bonded for much longer life than other chip-breaker diamond wheels. Reduce wheel and tool costs materially and speed grinding 3-4 times.

Complete facts in free 52-page catalog.

•

Grinding with Diamond or Abrasive Wheels is

☆FAST! ☆ECONOMICAL!



on the Wickman GF-2-A

With 1 HP reversible motor and impeller-type 12 gph coolant pump, this heavy bench grinder delivers fast, economical grinding with both silicon carbide abrasive wheels and Wickman steel-bonded diamond wheels. Wheel guards and splash protectors, three position table for wheel wear adjustment, plus a protractor slot for angular grinding, make this the ideal grinder for all off-hand grinding around the shop.

Delivery From Stock. Send for bulletin.

THE Wickman MANUFACTURING CO.
15533 Woodrow Wilson Ave.
DETROIT 3, MICHIGAN

Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Short Runs

Your article in Jan. 8 *AM* entitled "Band Saws Can Cut Blank Costs" is certainly interesting, but warrants an answer from the other side of the fense—the short run stamping machines.

Sawing blanks over 12 in. may certainly be practical if quantities run under 200 pieces and the material is relatively thin (less than ⅛-in.). Mr. Chamberland minimizes the costs of preparing the blanks for stacking, soldering or welding, and pinning, costs which must be carefully considered. More important, and neglected in the figures quoted, is the labor of finishing the blanks by filing, belt sanding or grinding. This is necessary to obtain the decent-looking parts necessary for all but the crudest products.

It seems to us than when a shop is confronted with the question of sawing out blanks or having them made by short-run stamping, cost estimates of both methods should be obtained so an intelligent evaluation may be made of the problem. Definite quotations are available from a number of companies specializing in short-run stampings, and estimates from plant foremen can be compared with these to determine the cheapest method.

It should be kept in mind that a punched part, made in a high-production or a short-run die, is uniform in size and has a cleaner edge. Holes or bends can be placed accurately in blanks which are identical, but not in sawed blanks. This difference in quality can be partially eliminated by accurately finishing the sawed edges, but obviously at considerable expense. The quality differential must be weighed too.

Your magazine is fine. We, in our small company, appreciate most of your articles which apply to general machine-shop problems, like the one mentioned above.

Johan M. Andersen
Chief Engineer
Duplicon Company, Inc.

Good Old Daze

I have an *American Machinist* magazine in my possession, dated Nov. 13, 1890, and would like very much if you could give me some idea of how I can preserve it.

I have tried Scotch tape, but it still gets torn beyond the tape and every time I let it go out to some of my friends in the machine shops around here, it comes back torn in some other place.

I am taking it to Potter & Johnston Machine Co., where I am working now, to let the different old timers see it. This will be the last until I find some way of taking care of it. I sure do get a kick out of it when I show it to an old timer. All they have to say is: "That is when they made good machines, good machinists, and good magazines—with good information and not all ads."

John H. Alexander
Pawtucket, R. I.

Scotch tape is normally suitable only for repairs to pages not to be kept for a long period, because the latex eventually works out from beneath the plastic strip and makes the edges of the tape stick to anything with which the piece comes in contact. What you need is a surface cover with some strength to replace that of the paper, which has become brittle with age. The only thing we can suggest is one of the new plastic coatings for such things as water-color paintings. They are available in art stores in pressurized cans, so all you need to do is spray the pages of the issue. This will provide some film strength.—Ed.

THE INDUSTRIAL CYCLE

We are living in an industrialized world. Our ancestors worked much harder and longer hours than we do yet they could produce only the bare necessities of life. We, because of the tools we have to work with, can produce the equivalent of not only all the necessities of life but many luxuries as well.

New machine tools that increase the productivity of the worker enables the manufacturer to Reduce Costs and pay Higher Wages to Workers. Higher Wages creates Greater Purchasing Power and Greater Markets. This means Greater Demand for goods and encourages Competition.

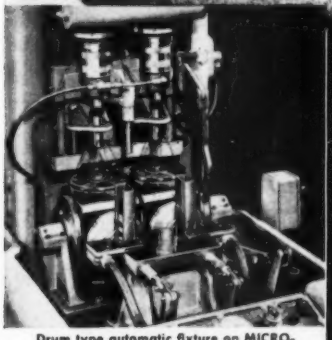
To meet this Competition the manufacturer must adopt Improved Methods and Equipment to get Improved Quality in his product and Greater Production. Greater Production means Reduced Costs and we start the cycle again.

Only by keeping this cycle in balance and in motion can we hope to keep our standard of living at its present high level. Only by increasing man's productivity by providing him with better, more productive tools can we keep our Industrial Cycle spinning.

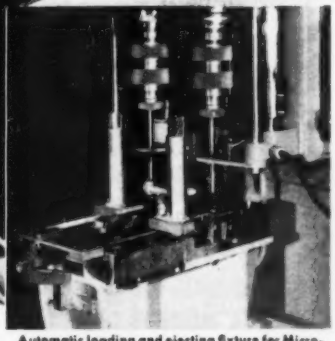
"MICROSIZE"*, automatic size control, is one of the contributions MICROMATIC* has made to modern tooling. MICROSIZE has made possible automatic and semi-automatic Microhoning* machines. It has Improved Quality and Reduced Costs by holding dimensional tolerances more consistently and reducing inspection and scrap. It has increased the productivity of the worker many fold.

Do not let obsolete methods and machine tools slow down your cycle.

*Registered U. S. Patent Office



Drum type automatic fixture on MICROSIZE controlled Microhoning machine.



Automatic loading and ejecting fixture for Microhoning gears on double spindle Microhoning machine, made possible by MICROSIZE control.

Write for latest issue of Cross Hatch on the Industrial Cycle.

Micromatic Hone Corporation 8100 SCHOOLCRAFT AVENUE DETROIT 4, MICHIGAN

District Field Offices: 1323 So. Santa Fe., Los Angeles 21, California • 614 Empire Building, 206 So. Main St., Rockford, Illinois
55 George St., Brantford, Ontario, Canada • Micromold Manufacturing Div., Boston Post Road, Guilford, Connecticut

MICROHONING = STOCK REMOVAL + GEOMETRY + SIZE CONTROL + SURFACE FINISH

OVER ONE HUNDRED YEARS OF CONTINUOUS SERVICE. ROUNDS, SQUARES, FLATS, HEXAGONS, OCTAGONS, BILLETS AND FORGINGS FOR PRODUCTION, TOOL ROOM AND MAINTENANCE REQUIREMENTS.

even tempered, but TOUGH!

HY-TEN "B" No. 3X

If you need even temper and toughness on heavy-duty parts, by all means investigate the unusual properties of HY-TEN "B" No. 3X!

WL can supply "B" No. 3X in bars, discs, flats or forgings heat treated to your exact hardness specifications. And this unusual HY-TEN alloy steel can be machined even when hardened as high as 477 Brinell (48 Rockwell "C")!

This unusual property—*machinability at high degrees of hardness*—makes this steel particularly well suited for parts which are apt to distort badly in the treating operation. This makes possible savings in handling and set-up time and finishing operations by putting parts into service without further treatment. A smoother finish is obtainable at almost any degree of heat-treated hardness than is possible with standard alloy steels.

WL *steels are metallurgically constant. This guarantees uniformity of chemistry, grain size, hardenability—thus eliminating costly changes in heat treating specifications.*

Write today for your FREE COPY of the Wheelock, Lovejoy Data Book, indicating your title and company identification. It contains complete technical information on grades, applications, physical properties, tests, heat treating, etc.

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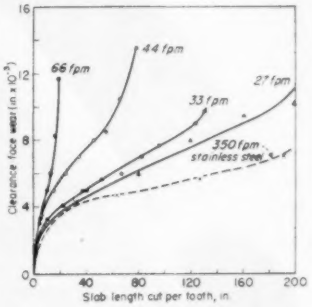
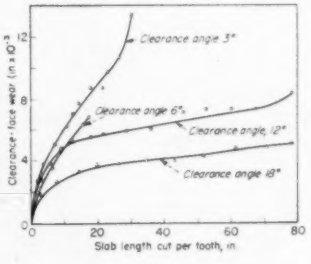
HY-TEN and AISI

More on HR Milling

In connection with your articles on high-angle milling (*AM*, Mar. 6, 1950) and turning (*AM*, Aug. 7, 1950), you may be interested in these charts. They show tests made by a large British company on Nimonic 80A, a British high-speed heat-resistant, jet-turbine blade alloy composed mostly of nickel and chromium, as I understand it. Cutting was done with an 18-4-1 HSS tool with 1/16-in. depth of cut and a 10-1 mixture of soluble oil and water. Rake angle was 10°, "spiral" or helix angle 15°.



In the first test, clearance angle was 6°, cutting speed was varied, and wear measured on the clearance at various surface speeds and lengths of cut. Average max. chip thickness was 0.0028 in. Nimonic 80A is obviously a pretty tough material to cut, when best cutting speed is 27 fpm, compared with 350 fpm for stainless.



In the second test, cutting speed was held at 49 fpm, max. chip thickness at 0.0022 in., and clearance angle varied from 3 to 18°. Note that, although a clearance angle of 3° is enough at the feed per tooth run, cutter wear was much less when clearance angles were increased to 12 and 18°. In other words, the higher clearance angles resulted in increased cutter life.

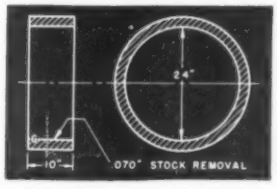
Name Withheld.

*What's in Vermont this month?**

ONE BRYANT INTERNAL GRINDER SAVES 14,560 HOURS IN ONE YEAR. A steel ring with a 24-inch I.D. and 10-inch length required 700 minutes floor to floor for finishing. Stock removal was about .070 inch. A new Bryant No. 1460 with a five-foot face plate was put on the job and finished the same pieces in 35 minutes, floor to floor.

One department estimated 16,640 hours grinding time for the coming year. On the basis of the above performance, this department's revised figure shows 2,080 hours grinding time to do the same amount of work, or a saving of 14,560 hours. This demonstrates clearly how important it is to check estimated production time on new available machines against the production time of the machines on your floor.

Bryant Chucking Grinder Company is prepared to give you accurate figures on production and costs so that your management can translate them



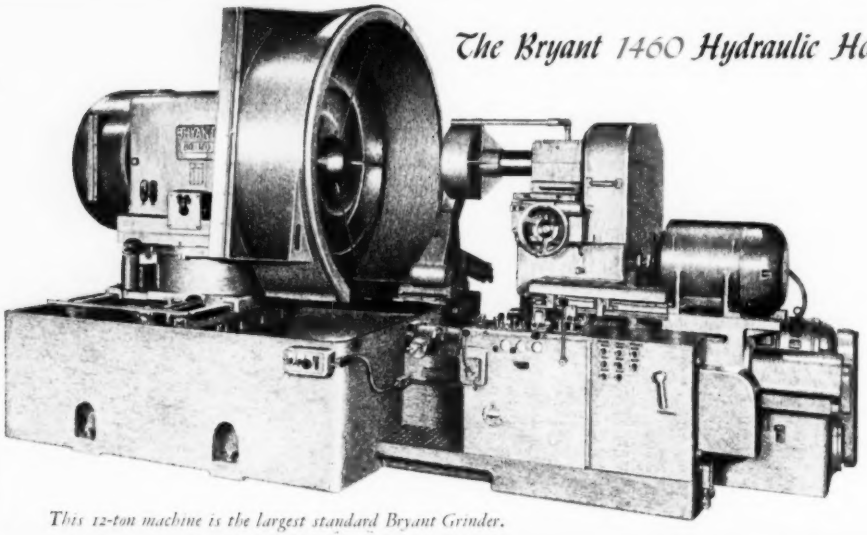
into terms of investment. Send your present production figures to Bryant now. We will give you data which may help you buy that new machine.

* Remember . . . it won't cost to inquire!

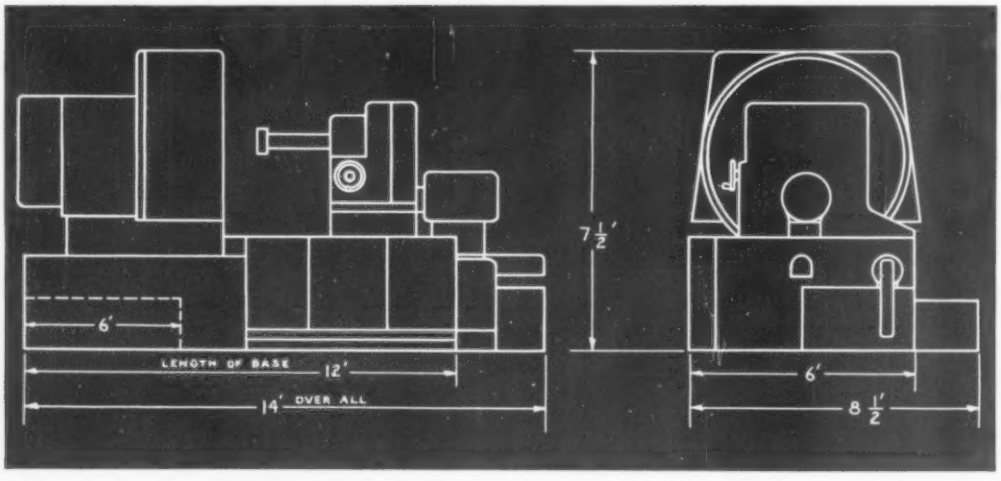
Bryant Chucking Grinder Company in Springfield, Vermont, U.S.A.

FOR HOLE GRINDING

The Bryant 1460 Hydraulic Hole Grinder



This 12-ton machine is the largest standard Bryant Grinder.



This massive machine will swing work up to 60" dia., making it ideal for large tool, die and bearing work. The workhead can be adjusted lengthwise so that minimum distance from workhead spindle flange to forward position of wheel slide is 24" and maximum distance is 44". To facilitate the grinding of large bores and faces or to obtain the proper crosswise position of the work when the workhead is pivoted for taper grinding, the workhead is adjustable 16" forward and 14" to the rear from the center of the machine. The full 60" swing can be had when the workhead is adjusted to 30° for grinding a 60° included angle. The 9" spindle bore allows long work to extend back into it if necessary. Hydraulic controls help make the No. 1460 easy to operate. Write for details.

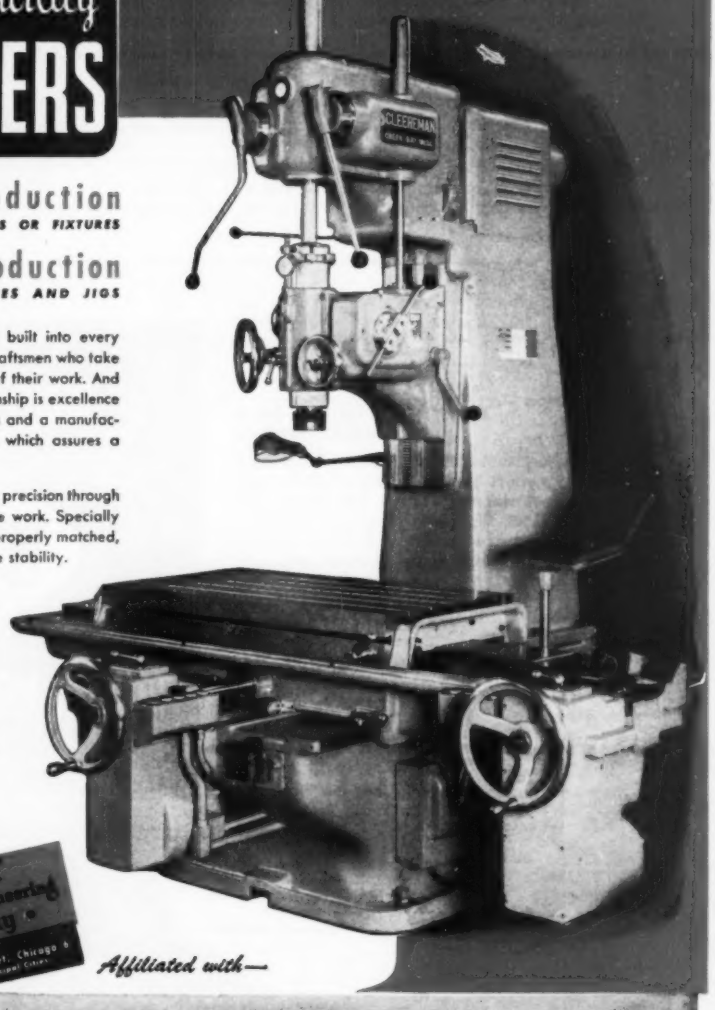
Bryant Chucking Grinder Company in Springfield, Vermont, U.S.A.

CLEEREMAN

UNEXCELLED PRECISION

PRECISION with STAMINA and *Operating Facility*

JIG BORERS



Small Lot Production
WITHOUT LAYOUT TIME, JIGS OR FIXTURES

Tool Room Production
OF ACCURATE TOOLS, DIES AND JIGS

UNEXCELLED PRECISION is built into every Cleereman Jig Borer by skilled craftsmen who take a personal pride in the quality of their work. And behind their exceptional workmanship is excellence of design, exacting specifications and a manufacturing technique and procedure which assures a precise machine tool.

STAMINA maintains this in-built precision through a long life of extremely accurate work. Specially processed and tested materials, properly matched, combat wear of ways and secure stability.

OPERATING FACILITY has long been accepted as characteristic of all Cleereman machine tools. Convenient, time saving grouping of controls aids appreciably in producing more work. Prepositioning power rapid traverse or electronic traverse and milling control accessories speed operation.

WIRE OR WRITE for catalog with complete specifications.

Address —

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Affiliated with—

CLEEREMAN MACHINE TOOL CO. Green Bay, Wis.
BUILDERS OF PRECISION JIG BORERS AND DRILLING MACHINES

proved in more than 10,000 shops...

KNURLED SOCKET HEAD CAP SCREWS AND STRIPPER BOLTS

. . . faster, easier driving with firm finger grip on the knurled heads—spin in with hexagon wrench.

DANLY TOOL, DIE AND GAGE MAKERS' SUPPLIES • DANLY TOOL, DIE AND GAGE MAKERS' SUPPLIES • DANLY TOOL, DIE AND GAGE MAKERS' SUPPLIES • DANLY TOOL, DIE AND GAGE MAKERS'

PRECISION DOWEL PINS

. . . specially hardened (58-60 Rockwell C) to resist upsetting—easier to drive with tapered leading ends to "pilot" the pin into the hole.

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assure tool and die makers of standard part quality fully consistent with good tool making practice. The Danly line includes many items in addition to those shown here such as set screws, bushings, toggle clamps and laps. A nation wide system of completely stocked Danly branches assures quick, convenient delivery.

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2100 South Laramie Avenue
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BUILD BETTER DIES WITH

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TOOL DIE AND GAGE MAKER'S SUPPLIES

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JOB TAILORED DIE SPRINGS

. . . two complete size ranges, for medium pressure and high deflection or high pressure and medium deflection—precision coiled and ground square for full end bearing.

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*WHICH DANLY BRANCH IS CLOSEST TO YOU?

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*Long Island City 1, 47-28 37th Street
*Los Angeles 54, Ducommun Metals & Supply Co. 4890 South Alameda
Milwaukee 2, 111 East Wisconsin Avenue
Philadelphia 44, 18 West Chelten Avenue
*Rochester 4, 16 Commercial Street
*Indicates complete stock

SPOT NEWS of Metalworking

- **Pool orders will start going out from NPA's Machinery Division** to machine tool builders this week. An M-order has been signed by NPA which will put into effect on April 1 the provisions of World War II's Preference Order E-1-B, revised to meet 1951 conditions. (For further details on machine tools, see p. 89.)

- **Buick's newest experimental car** has front fenders and hood as a single unit pivoted in front bumper and raised at rear by means of hydraulic window-lift mechanism. Other features: V-8 aluminum engine with 10-to-1 compression ratio; 116-in. wheelbase and over-all length of 192.5 in.; twin carburetors, stainless steel valve seats, machined combustion chambers, bronze valve guides, nichrome intake and sodium-cooled exhaust valves; bronze flywheel; car weight 3125 lb; engine has wet sleeves of alloy CI.

- **West Germany plans to deliver almost immediately to Eastern Germany** $19.6 million of machine tools and fabricated iron and steel products under advance delivery agreement just signed as part of long-term trade pact being negotiated. East Germany, in return, will send an equivalent amount of machinery, mining products, mineral oil, electrical equipment and other goods to Western Germany. Approval of western high commissioners is necessary for deal to be completed.

Chevrolet intends to make aircraft engines for Army Air Force at its Buffalo, N. Y. plant. One other General Motors plant facility will be involved in the Chevrolet project. Chevrolet has a large engine plant and an assembly plant at Buffalo.

- **An interchangeability program, amounting to a national aircraft extrusion die pool,** is being sponsored by Air Force, Navy and aluminum, magnesium and aircraft associations. An aircraft maker, under this program, will allow his dies to be used by all participating manufacturers and government agencies needing them. This enables extrusion makers to use any specified die in production of a specific extruson for any plane company's requirements. Extrusion producer agrees to maintain and replace all dies broken or worn beyond repair as long as there is a foreseeable future need.

- **British machine tool builders have booked 5000 square feet more of floor space** at Canadian International Trade Fair next May 28-June 8 than in 1950. British industry figures it should do at least $5.6 million of machine tool business in Canada each year.

- **First of Navy's postwar anti-submarine submarines,** designated K-1 (K for killer) will be launched early this month. Built by Electric Boat Co., K-1 lends itself to mass production—automobile style. It is 195 ft long, displaces 750 tons, is believed to have been developed from small German type XXI of World War II. Type XXI was produced in sections in German factories, and "prefab" sections assembled in shipyards. Russia got a lot of these ships after the war.

Prime defense contractors are being asked by screw machine products makers to finance purchase of new screw machines in 3-in. range. Latter have room in their shops to add one-third more equipment which could be operated as captive shops for prime contractors. Ample manpower with know-how is reported available to carry out this plan.

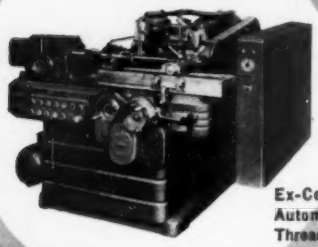
- **UAW-CIO collected $8.8 million in strike assessments** last year and spent $6.5 million. It paid out $3.8 million in 104-day Chrysler strike, $1.1 million in 112-day John Deere strike, $883,600 in 77-day International Harvester strike.

- **French auto companies expect to build 420,000 units this year,** as against 350,000 in 1950 and 286,000 in 1949. Renault is France's largest producer with 133,916 units last year, but Citroen, which turned out 81,768 units, holds the export lead.

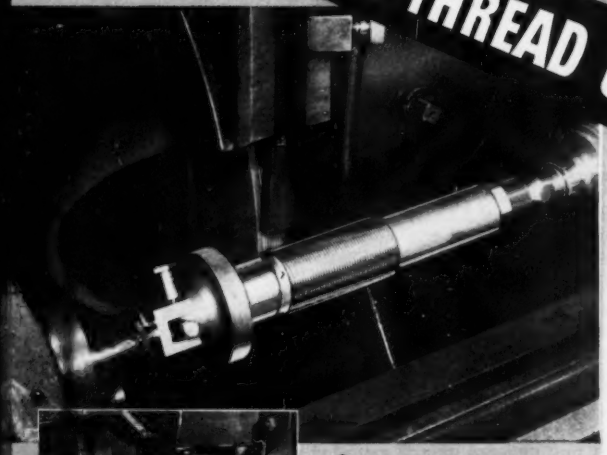
THE BUSIEST MACHINE IN YOUR SHOP

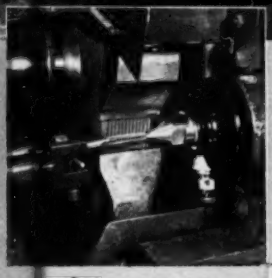
EX-CELL-O

AUTOMATIC THREAD GRINDER



Ex-Cell-O Style 33 Automatic Precision Thread Grinder for external threads. Standard models for internal threads and universal models for both internal and external threads also are made by Ex-Cell-O.

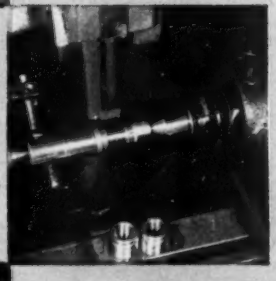


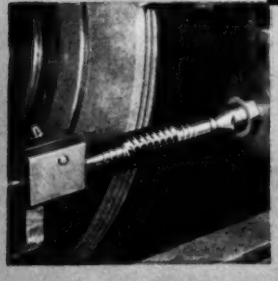


Grinding threads on cast-iron part with diamond dressed multiple-rib wheel on a Style No. 33 Grinder.

Skip-tooth diamond dressed multiple-rib wheel (wheel form is twice pitch of thread) grinding a ½"—18 tap.

Threading stainless steel aircraft bushings on an Ex-Cell-O Style 33 Automatic Thread Grinder.





All three starts of a triple-start worm are ground simultaneously with a triple-rib wheel.

For high production with extraordinary precision, Ex-Cell-O Style 33 Automatic Thread Grinder is a popular choice. It is easy to set up and operate. With equipment for using multi-rib wheels, as shown in the accompanying photographs, output exceeds other methods.

Thread grinding is a must for hardened steel parts. More and more shop supervisors are discovering that grinding is also economical for materials that are tough and abrasive, or soft materials that are inclined to tear under the pressure of cutting tools.

For more information on thread grinding call your Ex-Cell-O representative or write directly to Ex-Cell-O. Please state whether you are interested in internal or external threads or both.

XLO

EX-CELL-O CORPORATION DETROIT 32 MICHIGAN

51-13

MANUFACTURERS OF PRECISION MACHINE TOOLS
CUTTING TOOLS • RAILROAD PINS AND BUSHINGS
DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

Washington

The freeze on five-year amortization was ordered by mobilization boss Charles Wilson. It will continue until a new policy on all types of government aid for industrial expansion has been hammered out.

• • •

Machine tools makers were caught badly by the hold-up order—as were others who had started their applications for fast amortization certificates through the mill. Applications covering a half dozen new tool plants had initial approval, lacked only defense production administration's usually routine okay when the "freeze" hit.

What Wilson has in mind is a complete switch in direction of government stimulants to expansion. He feels that steel production, which has certificates for $3 billion of new facilities, now has sufficient plant under construction or in blueprint to meet all mobilization needs.

Thus, no more fast amortization for steel makers—unless military requirements suddenly leap.

• • •

That may mean more for tool builders—but only for plant to make tools needed directly for military production. That is, equipment to turn out shell cases, ships, aircraft and such.

Tools for essential civilan production qualifies for five-year amortization. But not for as much percentagewise. Wilson thinks the 55-80% of non-military plant covered by earlier certificates is too high.

So don't expect more than 50% coverage on the cost of your new plant unless it's closely tied to military production.

DO priorities will go with amortization certificates—so you can get the steel and other materials to build your new plant. You'll have to ask National Production Authority for the priority after you get your certificate, but it will be granted readily.

• • •

More will be done about scarce materials, especially metals like copper, zinc, nickel, chrome. It's a key point in Wilson's new expansion policy.

We'll get more metal from abroad. There'll be more deals like the reopening of Cuba's Nicaro nickel plant, which got a U. S. commitment to buy its entire output.

Marginal domestic mines will be reopened. They'll get government contracts with prices high enough to make them profitable. It's really a subsidy to mining—but we need the metal.

• • •

Union leaders will have more say about mobilization after the blowup over manpower and wage policies. They have Truman's ear, will run to him when they think they are being ignored.

Feeling against mobilizer Wilson had reached bitter stage when the blowup came. Labor's topside claim he is anti-labor, think he is behind move to kill 40-hour week in defense plants. This Wilson denied, of course. At any rate, the labor leaders won't be happy until Wilson goes.

Behind labor's protest against Arthur Flemming as Wilson's manpower policymaker is this fear: He will be dominated by Gen. Clay. This, labor thinks, will speed up compulsory manpower curbs, possibly favor military over defense in vying for skilled workers.

On wages, only this seems certain: They will be allowed to rise with the cost-of-living index through June. Wage policy will be reconsidered in the light of progress in holding living costs, and changes in Defense Production Act.

• • •

Metalworking industries led all others last year in number of workers winning wage increases. They were promised still more this year and next. More than 200 contracts provided more for almost 800,000 workers this year. More than 100 contracts give more to 700,000 in 1951.

Employment in metalworking hit a postwar peak of 7,000,000 in January, BLS reports. This was almost a million more than at Pearl Harbor; far below World War II peak of 10,000,000.

• • •

A further rollback of scrap metal prices may be in the works. Price stabilizer Di Salle says he is seriously considering it.

• • •

Any plant can use the new MRO (maintenance, repair and operating supplies) priority. You don't have to have other rated (DO) orders in your shop to slap a DO-97 on MRD items. Just write on your order: "DO-97. Certified under NPA regulation 4." And sign your name.

Ceilings on DO-97's are fixed by the dollar amount of MRO items that were delivered to you in your base period. You can use DO-97's for a quarter of that total. Base period is calendar 1950—or your own fiscal year ending nearest December 31, 1950. Seasonal businesses can use MRO priorities for quantities up to the total they received in the corresponding quarter of your base period.

Repair shops can use DO-97's for clients, as well as for themselves. But the certification must show the client's name so that it will be charged against him.

Hooker in the DO-97 regulation is this: Once you use it, you have to get all your MRO that way. That means you have to keep records on what you buy, where you get it, how you use it. And the DO-97 doesn't guarantee you'll get your MRO. It just gives your order preference over those without priorities.

Lowest Cost Way TO DE-BURIZE up to 300 Gear Teeth per minute

MODEL NO. 380-A

Cut finished gear costs and raise output at the same time—with Sheffield #380 Series Gear Deburizers which offer the following advantages.

★ Burr or chamfer spur, helical, hypoid, bevel and herringbone gears, also, multiple start worms, up to 7" O.D. (Model #381 will handle gears from 6" to 12" O.D.)

★ Operate on automatic or continuous cycle generally without clamping the work gear.

★ Use simple, low cost standard tool bits which are easily sharpened on the face angle only.

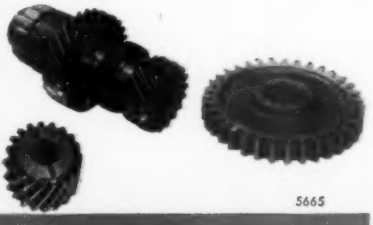
★ Interchangeability of tooling with minimum down time.

★ Small, compact, low cost machine requires minimum of setup and changeover time—and practically no maintenance.

★ Direct drive assures positive indexing.

Write for specifications #B-380-50 —or call your Sheffield Representative.

MODEL NO. 380-C



5665

SHEFFIELD MEASURING INSTRUMENTS · MACHINE TOOLS · CONTRACT SERVICES · INDUSTRIAL TOOLS

the Sheffield corporation
Dayton 1, Ohio, U. S. A.

Detroit

You, as a supplier, go to your automotive customer these days and say: "I can't make deliveries—I can't get steel."

Your customer's purchasing agent looks at you coldly. "Everyone else is getting it," he says, "You better give your purchasing department hell."

He makes it so positive that you hardly realize he's saying the same thing to everyone else who comes in with the same trouble. And everyone has that same trouble.

• • •

The discordant music in the air isn't confined to steel. There are two others of note right at hand — production allocations, and labor.

Consider production first. The second quarter is in jeopardy under cutback orders which will shave a very considerable proportion of output from schedules. That means layoffs, and layoffs that will not be remedied over the near term.

Consequently, idle workers can be expected to drift away from the labor pools of the individual companies. They will disappear completely, as present expectations go, about the time they will be wanted for defense projects. Right now arms jobs aren't tooled to the point that they can absorb this idle manpower. Maintenance of labor forces under these circumstances is as big a headache as the industry now faces.

• • •

Tied closely to this is the general labor picture. As things stand, wages have been limited by a ceiling. The CIO United Auto Workers, primary factor in Detroit and outlying automotive plants, says it won't take a freeze lying down, not if it impairs existing contracts.

In plain language, that means that whenever the ceiling stops the progression of escalator clauses, periodic automatic raises, etc., auto workers may be called out on strike. Managements understand, of course, that any action of the sort will be directed against Washington. But they will be the ones caught in the squeeze. They don't relish it. They see nothing they can do about it, either.

• • •

Tooling orders for military contracts are beginning to come out—they have been awaited for a long time, but the tide is beginning to roll. Largest orders are emanating currently from Cadillac and its tank program at Cleveland; there are some eye-widening stories extant about the number of Bullards this job will require.

Indicative of tooling costs on a job of this size is the fact that the allocation to Chrysler for equipping to make the Continental engine for tanks at New Orleans is no less than $30 million. The plant must be completely tooled.

Other recent tank contracts requiring complete tooling include one at Buick for transmissions ($65 million) and at Ford, for engines and spare parts ($40 million). Production is probably a year away in each of these two cases.

• • •

But real order swamping lies ahead — or so said Brig. Gen. Mark E. Bradley, Jr., of Wright Field. Speaking recently in Detroit he had this message:

Procurement sources will be duplicated, spread geographically to reduce vulnerability to enemy action. Industry is being asked to tool up for twice the rate of production required to equip a 95 group Air Force. Currently this will provide duplication of facilities—a safety measure. In an emergency it would provide for equipping a force from 180 to 200 groups in the shortest possible time.

• • •

A passing note on the effect of the rail strike: It delayed delivery of 28 carloads of machine tool equipment for Ford-Chicago.

• • •

The surge in industrial building is catching steel fabricators short. One of the largest of them has farmed out a job or two to some of its smaller competitors. It was simply unable to digest as much work as it thought it could.

Transformer iron has electrical manufacturers in a tizzy. Some of the smaller ones have been getting around their difficulty by importing iron for this use from Belgium. Copper is a more continuing problem, of course.

• • •

Truck production is being scheduled higher and higher. Today's indications point to 1951's becoming a superlative output year for trucks, counting both civilian and military vehicles. Manufacturers of both passenger cars and trucks are obviously figuring on using mounting truck output to make up to some degree the anticipated reductions in car volume.

• • •

The Army plans to build some trucks which really dwarf the imagination. One has undergone lengthy testing, may be put into production—a Goliath 8 by 8 job. That means all four pairs of wheels are driving wheels. All four axles are hooked up to the torque converter transmission and the 500-hp engine.

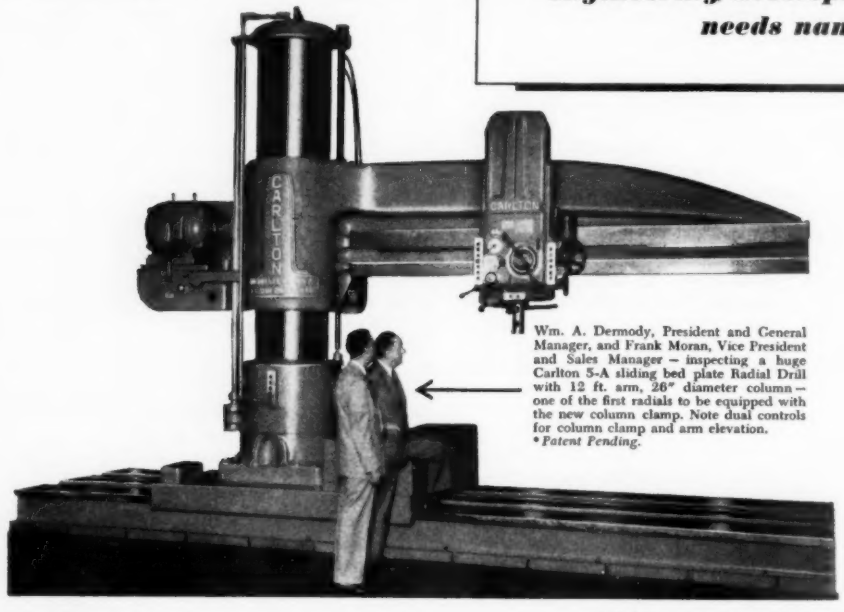
The two sets of wheels at the front steer in tandem. Power is such that the truck can climb vertical walls a couple of feet high. With trailer, these trucks can haul tanks around the country—or through shoulder-high water—about as easily as a delivery vehicle totes florist boxes.

announcing!

$1,000

Carlton column clamp name contest*

. . . latest Carlton engineering development needs name!



Wm. A. Dermody, President and General Manager, and Frank Moran, Vice President and Sales Manager — inspecting a huge Carlton 5-A sliding bed plate Radial Drill with 12 ft. arm, 26" diameter column — one of the first radials to be equipped with the new column clamp. Note dual controls for column clamp and arm elevation.
* *Patent Pending.*

The Carlton Column Clamp,* revolutionary new development contributing to more rigidity and greater accuracy in radial drilling, needs a name but quick. You can have yourself a lot of fun—and at the same time help us—by entering this novel contest. And if you submit *the winning name, you'll be $500 richer!* Furthermore, your Carlton distributor salesman will be awarded a $100 bonus—so count on him for lots of help.

Even though you don't win the grand prize of $500 cash, you may qualify for one of the many valuable honorable mention merchandise prizes which are worth $500 in the aggregate.

Contest Rules are Simple . . . send for them today. Fill in the coupon below and you'll also receive your official entry blank and the Power Clamping bulletin that tells you all about Carlton's sensational new column clamp.

Don't delay . . . contest closes midnight, March 31, 1951.
Fill in and mail coupon today!

Contest Committee
THE CARLTON MACHINE TOOL CO., CINCINNATI 25, OHIO

Gentlemen: I'll think up a good name for your new Column Clamp.* Send me immediately (1) contest rules and official entry blank and (2) Power Clamping Bulletin describing the column clamp.

NAME _____

COMPANY _____ TITLE _____

CITY _____ STATE _____

Machine Tools

Machine tool pool orders will start going out to builders this week. NPA's Machinery Division will complete the task of getting them out as soon as possible.

Most builders will participate. But pool orders are not all-inclusive so far as the machine tool industry is concerned. Sizes and types of machines most needed in defense production form the basis for these contracts.

An M-order has been signed by NPA which will put into effect on April 1 the provisions of World War II's Preference Order E-1-B, revised to meet 1951 conditions.

• • •

Army Air Force has placed $63 million of machine tools direct with builders since January 1. It is now ordering $12 million more.

These orders are on top of those from Air Force contractors and do not duplicate the latter. However, there is considerable duplication of Air Force orders in the pool orders now being sent out to machine tool builders by NPA's Machinery Division.

• • •

Air Force's action was based on desire to get required machine tool orders "rolling" without waiting for pool-order procedure, which was regarded as time-consuming.

Machine tool reserves of Air Force have been used to save months in starting some contractors on their production jobs. More than 20,000 machines from the reserves have been assigned to contractors.

• • •

Reserve machines are being rebuilt or reconditioned by these companies: Cincinnati Machine Co., Inc., Cincinnati; Patch-Wagner Co., Rutland, Vt.; Botwinik Brothers, New Haven, Conn.; C. C. Hoffaker Co., Cranston, R. I.; Morey Machine Co., Long Island City, N. Y.

Also Hammond & Barrie, East Providence, R. I.; Simmons Machine Tool Corp., Albany, N. Y.; J. L. Lucas & Son, Inc., Bridgeport, Conn.; Motch & Merryweather Machine Co., Cleveland; Superior Tool & Die Co., Detroit; Reliable Machine Rebuilders, Inc., Dearborn, Mich.

Also Standard Pattern Works, Detroit; Vimalert Co., Ltd., Jersey City, N. J.; Expert Die Tool Co., Detroit; and Modern Collett Machine Co., Detroit.

• • •

Wright Aeronautical (Sapphire jet engine), Ford at Chicago (Pratt & Whitney engine) and Allison are getting substantial ratio of their machine tool requirements from Air Force reserves.

Four big aircraft engine tooling jobs are coming up in the defense program: (1) Buick for Sapphire jet engines at Flint, which will take upward of 1500 machines; (2) Studebaker at South Bend; (3) Packard at Detroit; (4) Chevrolet at Buffalo.

• • •

New orders for machine tools soared to a new high in the defense program in January, when the index of the National Machine Tool Builders' Association jumped to 478.8. That compares with 410 in December, the previous peak.

Air Force business, already described, is believed largely responsible for this remarkable showing. Incidentally, Air Force orders were not pool orders, according to reliable reports. Each order was for a specific job.

Export business declined in January. British orders accounted for the extraordinary bulge in December foreign orders.

• • •

January shipments of machine tools dropped to 113.9 on the NMTBA index, from 135 the previous month. Backlogs of the industry, in general, thus rose to 17 months.

This setback in production points up the fact that the machine tool industry is having a tough time expanding output. It is competing unsuccessfully, in large part, with direct defense contractors for workers. It is subcontracting some work, but has run into trouble on this score, too. It is short of many materials. It is meeting with long delays in securing new machine tools to enlarge its operations. Its applications for certificates of necessity for plant expansion have gathered dust in NPA desk drawers.

• • •

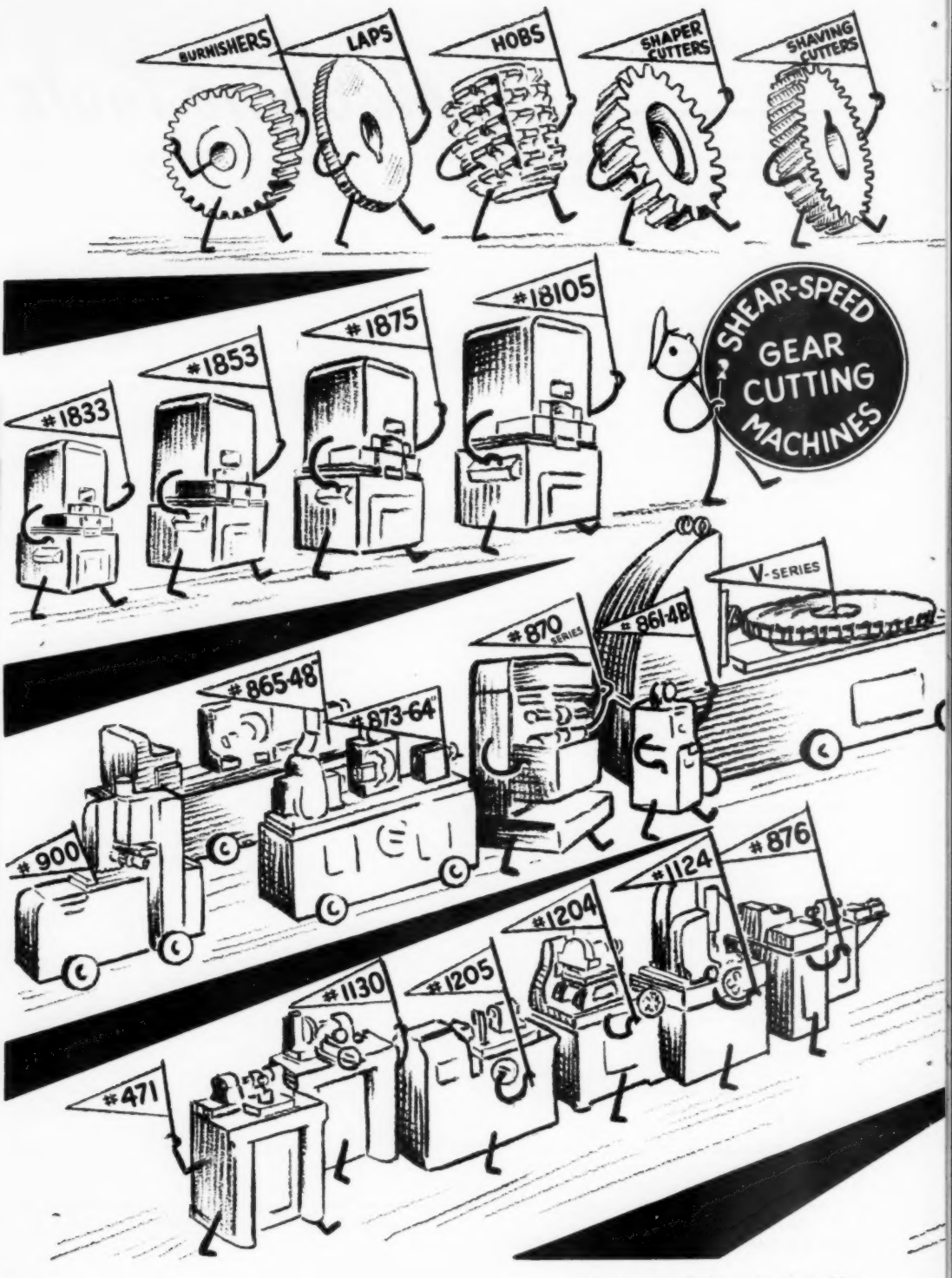
Air Force reminds machine tool builders that if they require new machines to turn out work for aircraft contractors, they should go to Air Force regional procurement offices and ask for a DO-98 rating.

Trouble is that a mere DO-rating will do no good. The order still will go to bottom of list of DO's already entered on builders' order boards. Only remedy will be issuance of a General Preference Rating, such as E-1-B.

Price freeze for machine tools is being modified so that prices on orders taken during freeze period (Dec. 19-Jan. 25) will apply, instead of prices on machines delivered to customers during that period. This interpretation will be used for all capital equipment, not machine tools alone.

• • •

Not all machine tool builders turned in their order boards for inspection to NPA's Machinery Division in January.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to solve your gear problems

. . . whether your gears are large or small (¼" to 14 ft.): You'll never need all this equipment. But, as specialists in the science of spur and helical gear production, Michigan Tool has to make and build all (*) of these machines and tools . . . for the simple reason that:

No one step in gear processing is independent of other steps
and
No one type of equipment is best suited to EVERY production setup

With its staff of gear production specialists—familiar with EVERY step in gear processing—backed by a complete line of equipment which we KNOW will do the job—Michigan Tool can give you not only *better* gears, but *more* of them . . . per man-hour and per dollar invested.

MICHIGAN TOOL Company

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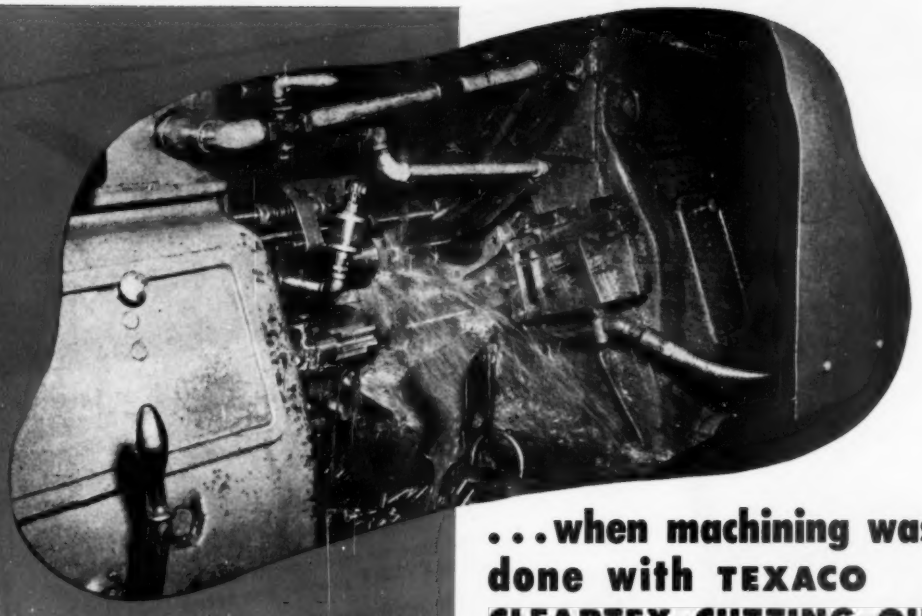
(*) plus some omitted for lack of space.



130% GREATER PRODUCTION between tool grinds...

...when machining was done with TEXACO CLEARTEX CUTTING OIL

In this plant,* steel parts for pumps were being machined on Acme Gridley automatics. Two different competitive oils were being used — one as cutting fluid and the other as machine lubricant. Production lagged because of frequent tool changes, and contamination of coolant by machine oil necessitated frequent oil changes.

Then a Texaco Lubrication Engineer was asked what could be done to speed up production. He recommended using *Texaco Cleartex Cutting Oil B* as both coolant and machine lubricant. One oil thus replaced two; contamination problems and oil wastage were eliminated — and *production between tool grinds immediately jumped 130%!*

Machining stainless steel on the same set-up, use of *Texaco Cleartex Cutting Oil B* increased production between tool grinds 42%.

Let a Texaco Lubrication Engineer specializing in metal working help you gain increased production and lower unit costs in *your* plant. There is a complete line of Texaco Cutting, Grinding and Soluble Oils to help you do every machining job better, faster and at lower cost.

Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

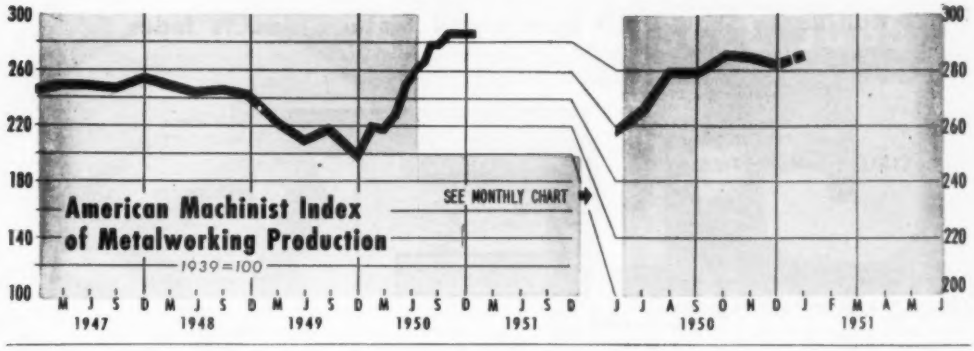
Name of this Texaco user on request

TEXACO

TEXACO CUTTING, GRINDING AND SOLUBLE OILS FOR FASTER MACHINING

TUNE IN . . . TEXACO presents MILTON BERLE on television every Tuesday night. METROPOLITAN OPERA radio broadcasts every Saturday afternoon.

Gaging Metalworking



Metalworking Production at Postwar Peak

Metalworking production stands at 293 in February on the AMERICAN MACHINIST Index, which takes 1939 as 100. That is the same as the January figure and is six points higher than the December total (287). The index is based on manhours worked.

The tremendous upsurge in metalworking the past year is shown by the fact that the index in January a year ago was at 221, by contrast with 293 now. At almost three times the rate which prevailed in 1939, metalworking today is at a postwar peak (August, 1945, was 298).

• • •

A glance at the components comprising AMERICAN MACHINIST'S Index reveals that the spectacular gain over last year came in three fields: (1) industrial machinery, which at present is at 288, against 199 a year ago; (2) electrical manufacturing, at 330 compared with 246 in January, 1950; (3) transportation equipment (excluding autos but including planes), at 311 against 208.

• • •

Leading farm implement companies do not expect any significant change in plans for high production of full range of products in March and in second quarter.

One important maker states that Feb.-April period will be as big production-wise as Nov.-Jan. period, which set a new peak.

• • •

Many automotive parts manufacturers are undisturbed about proposed cutback in car assemblies. One Cleveland firm says that it merely will be serving other customers, mostly defense contractors. Another has same reaction and plans expanded facilities. A third believes increased truck output and defense subcontracting will compensate for declining auto business. Many companies will switch over substantial part of plants to aircraft parts.

Auto assemblies, meanwhile, have skyrocketed to new peak, at 10-million-unit-a-year rate, as factories seek to make up time lost during railroad strike and to produce as much as possible before limitations are enforced.

Employment situation in metalworking is getting worse. Chicago reports acute shortage of skilled die makers and machine operators. Double shifts are common throughout metalworking, with third shifts being put on where manpower is available.

• • •

Screw machine products makers say that business is up 20% in past three months, with backlogs equal to 20-weeks' output. Some cancellations of civilian-goods orders will come through later on. While much work is done for auto industry, cancellations from that source will be light and will be offset by new business from defense contractors.

INDEX

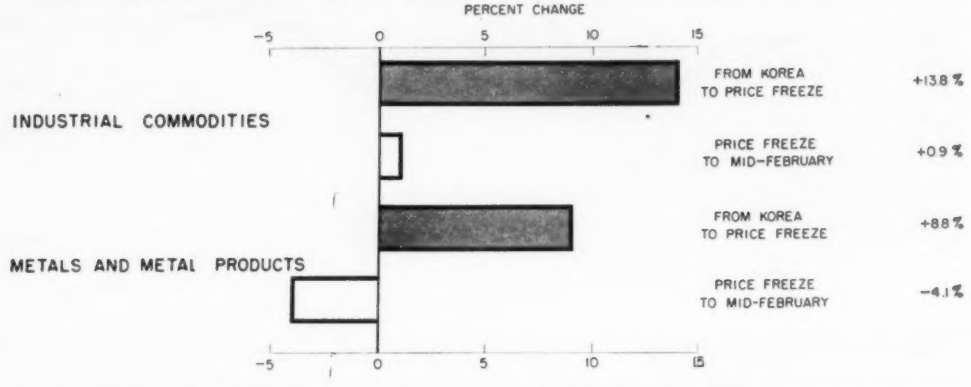
	FEB. '51	JAN. '51(p)	DEC. '51(r)	FEB. '50
	293*	**293**	**287**	**221**
Machinery		**288**	**273**	**208**
Electrical Manufacturing		**330**	**329**	**252**
Automobiles, Trucks		**250**	**250**	**188**
Transportation Equipment		**311**	**298**	**214**
Other Metalworking		**309**	**307**	**239**

AMERICAN MACHINIST'S INDEX OF METALWORKING PRODUCTION is based on manhours worked in the five components above.

* Estimated (p) Preliminary (r) Revised

Gaging Business

Price Roll Backs Show Up in Metals and Metal Products Index



More inflation is "just round the corner." Pay increases are on the way which will raise hourly rates at least 10% above Jan. 15, 1950, level. Price Stabilizer DiSalle expects prices to level off next summer at about 5% higher than current level.

New restrictions on installment buying of consumer durable goods are "in the works." Federal Reserve Board will demand bigger down payments and shortening of payment period.

• • •

Backlogs of durable goods industries averaged three months at end of December. That is about same ratio as in latter part of '48.

Freight car builders had 145,000 cars on order Feb. 1. NPA is allocating steel for 10,000 cars monthly. Current output, however, is only 60% of that rate.

Shipyards are to get enough steel in second quarter to carry out repairs and conversion of passenger ships to troop carriers.

This will be a big construction year, despite controls. Forced shrinkage of commercial and home building will be mostly offset by big industrial and government construction. Guess for 1951 total: $25 billion, only $3 billion under '50.

Construction machinery people are optimistic about output in March and second quarter. One maker reports government orders equal to 15% of last year's total dollar volume, but cannot tell yet how civilian production will be affected, as delivery schedules have not been worked out.

Lead time in shop for materials ahead of shop operations has been cut to low average of 30 days by this maker—and by others.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index Activity (1923-1925 = 100)*	232.4	231.8	189.8
Steel ingot operations (% of capacity)	99.5	98.5	88.8
Electric power output (million kilowatt hours)	6,905	6,957	5,931
Production of automobiles and trucks	174,414	116,020	123,712
Engineering construction awards (Eng. News-Rec., millions)	$223.8	$256.5	$263.6

MONTHLY BUSINESS INDICATORS

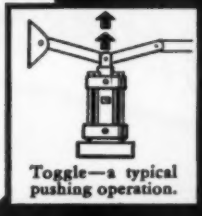
	Latest Month	Preceding Month	Year Ago
Index of industrial production (1935-1939 = 100)*	219	216	183
Index of durable manufacturers' production (1935-1939 = 100)*	273	268	209
Durable goods, manufacturers' sales, millions*	$9,725	$9,730	$6,516
Electrical machinery manufacturers' sales, millions*	$1,059	$1,108	$676
Other machinery manufacturers' sales, millions*	$1,525	$1,108	$1,028
Durable goods manufacturers' new orders, millions	$11,386	$1,544	$6,923
Electrical machinery manufacturers' new orders, millions	$1,371	$10,631	$706
Other machinery manufacturers' new orders, millions	$2,000	$1,935	$1,018

* Seasonally adjusted.

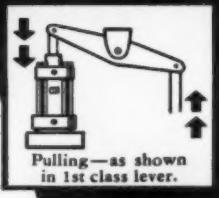
Rasslin' with HIGH COSTS?

SAVE on "MUSCLE JOBS"

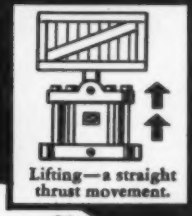
with T-J CYLINDERS



Toggle—a typical pushing operation.



Pulling—as shown in 1st class lever.



Lifting—a straight thrust movement.

Air or hydraulic power—applied by T-J Cylinders—gets an amazing lot of tough jobs done for industry . . . *faster, more efficiently,* and *at lower cost!* Check your plant operations and machines *now*—make a note of mechanical movements that can be simplified and speeded up with T-J Cylinders! Designed for a wide range of pushing, pulling, lifting, clamping or control jobs . . . 100 lb. or 50,000 lb. Many standard sizes and styles . . . both cushioned and non-cushioned types . . . precision-built, dependable. Write for additional information. The Tomkins-Johnson Co., Jackson, Mich.

35 YEARS EXPERIENCE (T-J)

TOMKINS-JOHNSON

RIVITORS . . AIR AND HYDRAULIC CYLINDERS . CUTTERS . CLINCHORS

Imagine the precision drilling machines that would be necessary to machine this piece on a non-automatic basis. Think of the space, operators, transfers from machine to machine and the time wasted. Contrast that with this specially designed Morris MOR-SPEED High Production Machine.

A single hand clamp fixture holds the work while the machine automatically indexes through four stations. The rear angular head, mounted on hardened and ground ways, carries six spindles for the spot facing operation. The two angular heads on either side alternately drill and countersink the two tap holes. Rated production of 60 pieces per hour is accomplished at 75% efficiency.

Morris MOR-SPEED Production Machines have earned the enthusiastic approval of economy minded production men in the nation's leading plants. Production time, multiple handling, delay between operations and valuable floor space have been saved. If your work requires automatic multiple drilling, reaming, tapping, boring, etc., on a mass production basis, consult Morris Engineers.

THE MORRIS MACHINE TOOL COMPANY

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Builders of MOR-SPEED Line

933 HARRIET STREET CINCINNATI 3, OHIO

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Facing the Facts About Manpower

Manpower will be the eventual pinch in the defense program. Charles E. Wilson, president of General Motors, spoke thus last October.

He pointed out that defense weapons are not primarily designed for mass production. More labor by far is required per pound of product than in manufacture of consumer goods.

THE PINCH already is being felt. Defense industries — largely metalworking — must find one million more men this year.

Where are they coming from? From nonessential industries and farms, of course. And a certain number of women will be included.

Don't forget, also, that the armed services will be taking men at a rate of at least 100,000 a month throughout 1951. Youngsters who normally would seek factory employment will be toting guns instead. Some of the draftees will come from factories, too.

If you should take a long-range look at manpower, there is another element to be reckoned with. The working-age group (18 to 60), as a "long-after" effect of the depression of the 1930's, will grow only an estimated 6% during the decade of the fifties.

The number of children in our schools, meanwhile, will expand about one-third. And the group of people over 60 will increase in the same ratio. Our nation as a whole will have greater wants to be filled than ever, and there will be only a few more people to fill them.

THIS MEANS that we are faced by a long-term as well as a short-term pinch in manpower. We no longer can afford certain luxuries in manpower wastage, such as featherbedding, unless we are willing to let some of our work go undone. If we do that, our standard of living will suffer.

It means, more than ever before, that we must produce more per person, without burdening anyone with more physical effort. Increased mechanization is the only possible answer. Savings as yet unknown can be made by mechanization if we set our hand faithfully to the task and if union leadership will cooperate.

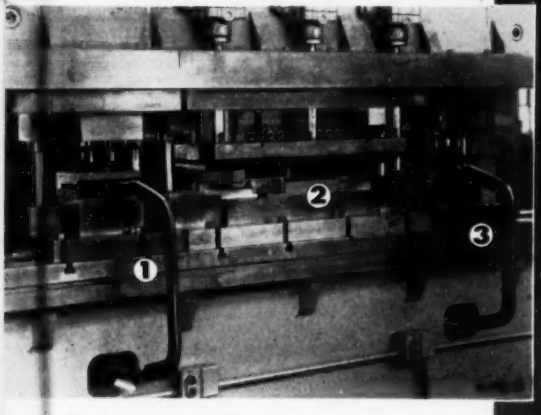
Aside from mechanization, much can be done to conserve manpower. Management can do nothing better than to take inventory now of its manpower resources, of the job to be done, and how one matches the other. It may discover that the work being done today takes more men than it should; and perhaps some economies can be instituted.

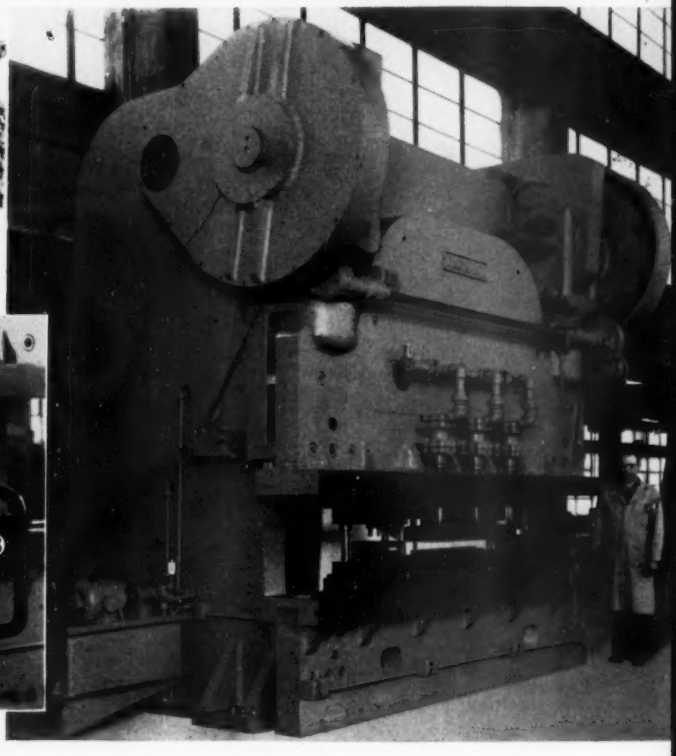
IN ANY EVENT, metalworking management will do well to find out exactly where it stands and what its future manpower requirements probably will be. Then action should be taken, as far as possible, to be ready to meet the anticipated shortage when it occurs.

Remember that short-term action will be only a stop-gap. A long-term program is imperative. It should be formulated without delay.

Burnham Finney

COSTS CUT FROM $25.26 to $2.24





Photographs courtesy of International Harvester Company

Simultaneously punching **3** draw bars on self-contained interchangeable die sets.

1000-Ton Cincinnati All-Steel Press Brake punching 1045 H.R. Steel tractor draw bars.

The cost of two machining operations on draw bars for International Farmall Tractors was reduced from $25.26 per hundred to $2.24, by changing the method to punching on a Cincinnati Press Brake.

This Cincinnati 500 series All-Steel Press Brake is punching 13 holes and 2 slots in $\frac{5}{8}$" SAE 1045 H.R. steel draw bars. Hydraulic strippers clamp draw bars flat and strip punches effectively. High visibility of work is obtained. Two types of bars are produced and interchangeable dies are engineered for easy, quick changeover.

Investigate! Your costs may be reduced by using a versatile Cincinnati All-Steel Press Brake.

Write for the comprehensive and suggestive catalog B2A on Cincinnati Press Brakes.

THE CINCINNATI SHAPER CO.

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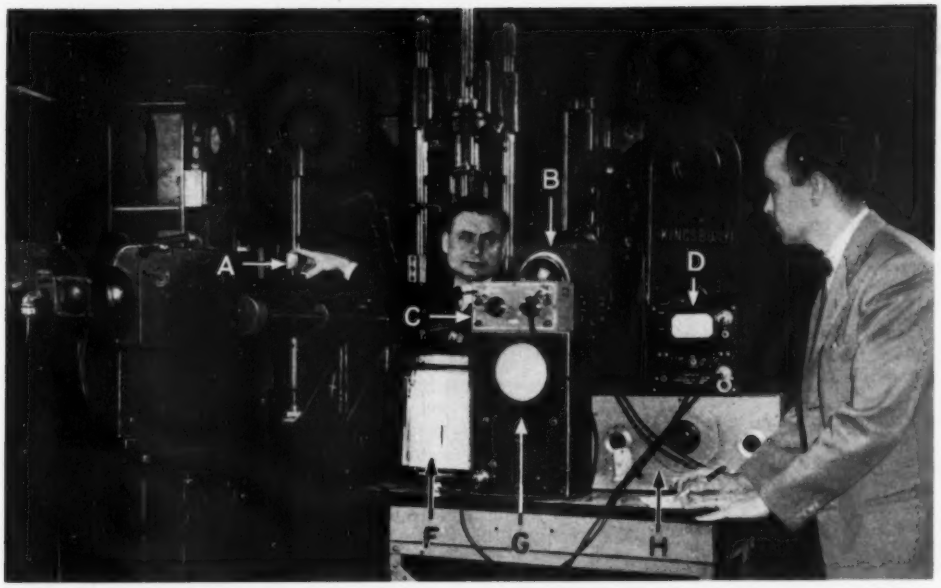


Production analysis of machine and tool performance saves trouble when the new machine reaches the shop floor. Charles H. Petty and Paul C. Eberhardt, staff engineers, Manufacturing Engrg. Dept., Ford Motor Company, show major test devices employed. These are: *A*—Consolidated Engrg. velocity pickup; *B*—General Radio Strobotac; *C*—DuMont voltage calibrator; *D*—Consolidated Engrg. vibration meter; *F*—Esterline-Angus recording wattmeter; *G*—DuMont cathode-ray oscillograph; and *H*—Hewlett-Packard audio oscillator

HOW FORD CHECKS MACHINE TOOLS AT THE BUILDER'S PLANT

By catching any undesirable feature in high-production equipment before it leaves the builder's plant, Ford avoids the usual "bugs" at the time of installation. And the vendor's engineers and men are on hand to make any desired changes

BY RUPERT LE GRAND • Associate Editor

IN NORMAL procurement of high-production machine tools, both the automotive company's engineers and the vendor's engineers study a specific problem carefully, draw upon past experience, and produce a design that has the earmarks of a sound, cost-cutting proposition. And the builders of single-purpose machines have long recommended that customers witness test runs on the completed machines and obtain instruction on operation and maintenance, before accepting delivery.

This procedure has obvious advantages to both the buyer and the seller. The buyer has the opportunity of discussing the various features of the machine with the men who actually engineered and built it. Time is saved in getting the machine into production in the customer's plant. Often, the need for servicemen's calls is eliminated.

Since starting to apply machinability data (*AM*—Nov. 27, p109) to specification of new high-production machine tools, Ford has added certain ideas to the normal acceptance-test procedure. Experience has shown that produc-

tion increases of five to ten times over those available from conventional machines are possible by tooling equipment with carbide, supplying adequate power, and cutting metal at optimum speed and feed rates for the microstructure involved. These matters, plus chip handling arrangements and the application of automatic loading, unloading or clamping devices, play important parts in obtaining the greatest possible number of pieces per hour.

One study made along these lines was related to machining cast-iron water pumps. Twelve conventional machines were being used on a three-shift basis to turn out pumps for the Ford and Mercury passenger-car engines and the Ford truck engines.

To save machine tools and floor space assigned to this job, an analysis was made on the basis of using multi-station equipment tooled with carbides and equipped with fixtures to run any one of the three pump bodies. Purchase orders were issued to the Kingsbury Machine Tool Corp. for two No. 201 central-column, eight-station, drilling and tapping machines.

After acceptance tests and modifications decided upon in the interest of manufacturing the highest possible number of pieces per hour without sources of production interruptions, these machines were installed. One machine handles right-hand pump bodies, the other the left-hand castings. By combining the operations of four machines into one machine, a considerable reduction in handling time has been achieved. Moreover, each machine produces 435 pcs per hour at 100% duty cycle. The department now operates two shifts or less.

Acceptance Tests

In acceptance tests on the two Kingsbury machines, special attention was paid to several matters because of the high production expected and the high cutting speeds employed. All tools except the taps are carbide. For drilling, speeds are from 138 to 260 fpm, and for reaming, speeds range from 86 to 318 fpm.

In addition to the usual tests for size and location of the operations performed on the pump bodies, Ford engineers made vibration-amplitude tests of machine parts. A velocity-type vibration pickup was applied to the machine. Electrical output of the vibration pickup was analyzed by an audio oscillator, cathode-ray oscilloscope and a voltage calibrator.

Vibration tests revealed two problems. In milling an interrupted slot at Station 7, the amplitude of vibration, peak to peak, was found to be 0.013 in. at the outer ends of two guide rods supporting auxiliary spindle units. This condition was easily corrected by using a heavier outboard mounting plate for the guide rods and securing the plate to the machine with heavier screws.

The second source of vibration lay in the part itself. In drilling the water-heater hole in the right-hand pump at Station 5, a casting-flash condition affected break through of the drill. This problem was solved by modifying casting procedure.

Power Analysis

The power analysis was made with a recording wattmeter and clamp-on ammeter, in order to determine the load characteristics of the various operations along with the cycling characteristics of the machine. All motors were found to be operating within specified ratings when under load. Several minor changes were made in electrical controls to provide more convenience in loading and unloading.

Chip-Disposal Problems

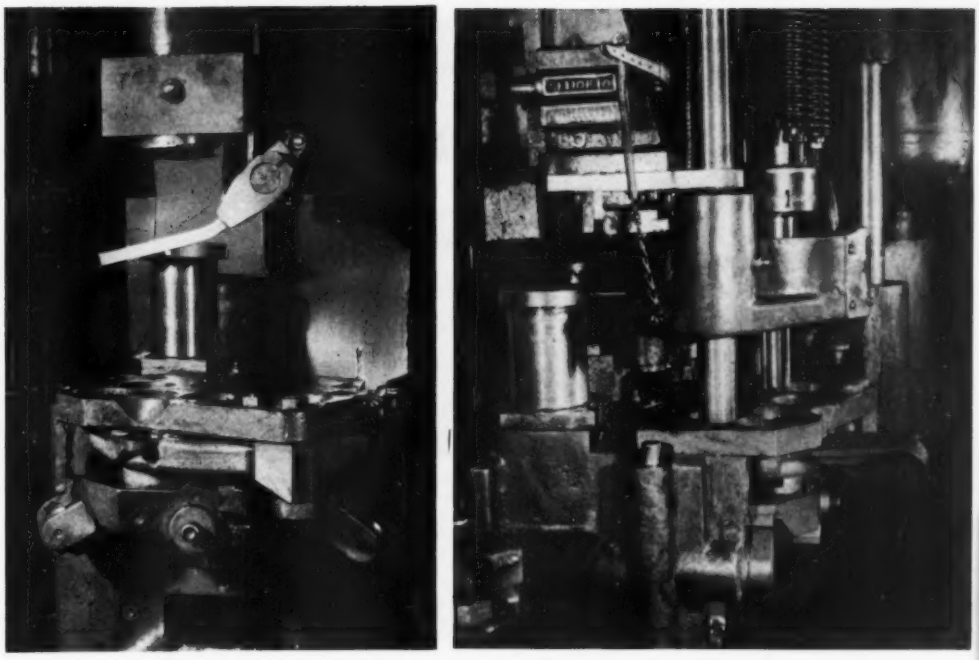
Inadequate chip-disposal means on a machine tool has been found to cut rated hourly output as much as 20% or more. Sometimes the condition cannot be corrected. In the case of the Kingsburys, chips were prone to pile up on the lower spindle housings. This condition was corrected on the builder's floor by attaching paddles to the spindle flinger, so as to throw off the chips. Some chip accumulation was noted at the rear of the fixtures, and an additional wash-out was provided at the last reaming station.

Tool Development

After various test runs, the parts were inspected for finish and the tools were inspected for condition. Some trouble was encountered with the carbide-tipped drill for the water-heater hole. Part of

ACCEPTANCE TESTS and TEST DEVICES EMPLOYED by FORD for PRODUCTION ANALYSIS on MACHINE BUILDERS' FLOOR

	TEST	INSPECTION DEVICES	RESULTS OBTAINED
1	Part size and finish	Standard micrometer and toolroom measuring equipment. Profilometer	Conformity with part specifications for dimensions and finish.
2	Power analysis	Recording wattmeter, current transformers, clamp-on ammeters	Machine-load characteristics, maximum power required, average and minimum cycle times, load changes with feed, speed and tool changes.
3	Vibration analysis	Vibration pickups, cathode-ray oscillograph, an oscillograph voltage calibrator, audio oscillator, vibration meter	Frequency of vibration generally gives the source, such as gear train or unbalanced spindle. Amplitude of vibration affects tool life and machine life.
4	Tool life and application	Strobotac, scale and magnifiers, hand tachometers	Spindle speeds are checked for actual machining speeds; tools for wear and proper grind.
5	Stress analysis	Strain gages, strain-gage amplifiers, recording oscillographs	Excessive stresses, static or dynamic, in machine members are revealed. Test not as useful as vibration analysis, generally speaking.



Fixtures on Kingsbury accept three different pump castings. Left—Casting is securely located at loading station by fixture that has nest for a boss plus side cams and hold-down plate actuated hydraulically. Right—At station 8, the impeller-shaft hole is step reamed

the difficulty was attributable to the casting flash mentioned. However, it was found that the hardness of the high-speed-steel shank of the drill was not up to specifications.

Considerable effort was devoted during the acceptance tests to time study of the loading and unloading operations. As the machine was set up, a considerable amount of effort was required by the operator to keep pace. Actually, the operator was setting the production rate, because he was required to trip the unclamping mechanism. Hence, the machine was equipped with a device that automatically opens the fixture-unclamping valve at the loading position. Also, the operator had to hold down an index button if he had unloaded and reloaded but some heads had not completed their cycles. A two-second delay hold-down for the index button was installed to relieve the operator of the necessity for keeping his hand on the button, and allowing him to pick up another part. With these modifications, the machine sets the pace, produces the rated 435 pcs per hour at 100% duty cycle, and the operator has no trouble in keeping pace with the equipment.

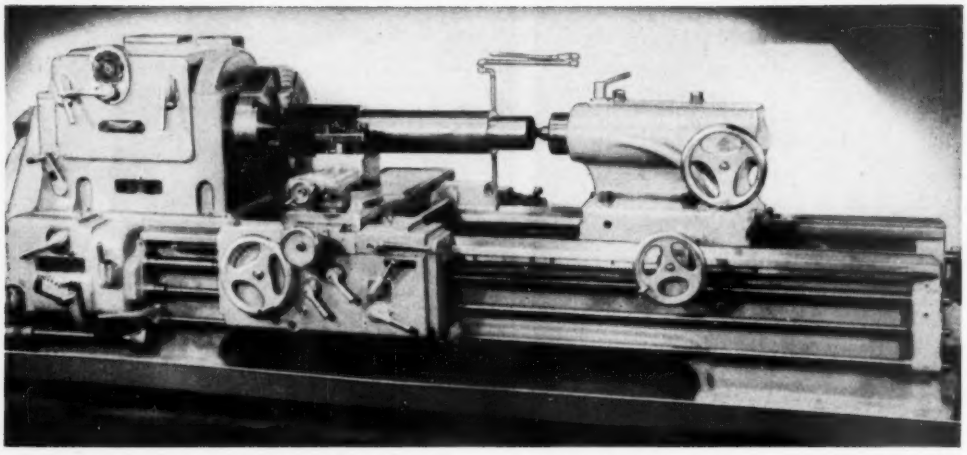
For protection of machine and operator, according to the experience of production-minded engineers and supervisors, certain guards were added to the machine. In one case, a cover was applied to keep cast-iron grit out of the seal and hardened bushing for vertical guide rods.

This summary of changes requested by Ford engineers covers the more important matters. By processing some 7000 pump bodies through the machines while still on the floor of the Kingsbury plant, all persons concerned had a chance to study the production effectiveness of the equipment. Modifications or improvements could then be carried out by the builder's engineers and shop force under the best possible conditions. Shutdowns of the machines and lost production at the Ford plant were avoided. The machines were installed only when both parties were reasonably certain that production quantities and tool life would be met.

Tips FOR TOP SHOP MEN

378 "Put it in writing" provides a record of an idea. But be sure you don't advocate the practice because you don't want to listen, because you're afraid to decide, or because you're stalling to find some way of giving the idea man a runaround.

379 Be sure your "grown-up toys" don't take more time than your work. Don't spend more time on filling out forms or on setting up systems than the forms or systems save. And it may be worth as much to you to find out what's on a worker's mind as it is to solve the latest radio mystery.



First tests were run on this Sidney 32-in. Model 16 heavy-duty lathe with 28-in. 4-jawed steel-body independent chuck mounted on the standard D-1-11 cam-lock spindle nose. This machine has herringbone-geared headstock and gives 16 speed changes. All cuts were taken in the high cycle of the speed range without using the backgear ratio. To compensate for heavy tool pressure, an English-type tool rest was used, providing better clamping

"We Turned SAE 1045 at 2150 SFPM"

To explain . . . *John A. Pitt, planning and time study engineer for James Archdale, Ltd., Worcester, England, read our article, "Are Shop Men Scared of High-Speed Machining" (AM Mar. 6, 1950). He wrote (AM, Feb. 19, p. 112): "Is it possible to apply these speeds to turning operations to get production and economical tool life using commercial carbides?" Mr. Pitt had the initiative to make his own test, on EN9, normally cut at 450 sfpm. He halved cut and feed and raised speed to 1500 fpm. Even with a lapped edge, the carbide tool failed in ¾ in., leading Mr. Pitt to the conclusion that such high speeds are not practical in turning. Here is an answer to Mr. Pitt's letter detailing tests successful up to a new high surface speed*

BY F. J. FIELDS
Vice president and general manager
THE SIDNEY MACHINE TOOL CO.,
SIDNEY, OHIO

I HAVE carefully noted John A. Pitt's comments in regard to his experiment and might state that we, too, in conducting experiments on Sidney lathes using carbide-tipped tools, have experienced the same conditions. However, we have in one of our recent tests been able to turn metal at considerably higher surface speeds with success than the 1500 sfpm mentioned by Mr. Pitt.

First Test

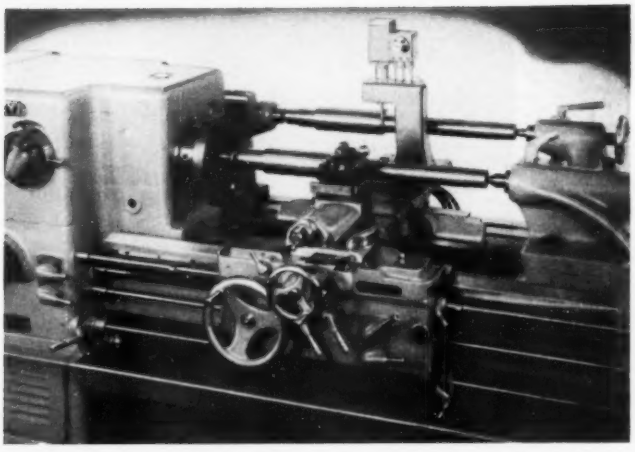
Some time ago, we conducted a test on SAE1045 steel with a 32-in Model 16 lathe. Results of this test are given in the table. In conducting this test we were primarily interested in the relative horsepower requirements for removal of 1 cu in. of metal, and found that this is very dependent upon the cutting speed and feed per minute employed. Here we used cutting speeds generally accepted as normal for carbide use.

The cutting tool used was Grade 78-B Carboloy, cemented to a 1 x 2-in. shank, the cutting edge of which was 15/16-in. long and ground with a chip breaker. The same tool was used during the entire experiment. On the last test cut in the table the tool cut for 20 minutes without interruption, during which time the cutting edge turned white hot. When permitted to cool, the tool showed no visible signs of wear, and there were no indications of chatter marks on the work.

From this test and after experiencing much the same conditions that were experienced by Mr. Pitt in obtaining the higher speeds, we thought of other plans to combat these difficulties and conducted our second test.

Second Test

Here, we used the 16-in. Model 32 lathe. However, during this test we did not employ our Sidney Fluid Tracer or, as Mr. Pitt termed it, copying attachment, and used the conventional lathe for turning



2150 sfpm in cutting SAE1045 were obtained on this Sidney 16-in. Model 32 lathe with tracer detached. This machine has a herringbone-geared transmission and a GE 15-hp adjustable-speed motor operating at 2500 rpm. Headstock drive is through 2:1 ratio heavy-duty V-belts at 3240 rpm surface speed. Driving clutch is the standard 8-in. Twin Disc Model CL with single driving plate, capacity 40.7 hp

Precooling to —5F permits turning without burning carbide tool tip. A 24-in. cut showed very high finish, with no signs of tool wear or failure

SUMMARY OF FIRST TEST

Depth Cut	Feed	Dia	Rpm	Cutting Speed, Fpm	Cu In. metal removed per min.	Amp	Hp Required
3/8	.010	8 9/16	106	237.7	10.224	20.0	16.8
3/8	.010	8 9/16	140	313.9	13.503	23.0	19.32
3/8	.012	8 9/16	140	313.9	16.205	26.5	22.26
3/8	.014	8 9/16	140	313.9	18.906	27.0	22.68
3/8	.017	8 9/16	140	313.9	22.957	31.0	26.04
3/4	.008	9 5/16	83	202.4	13.396	25.5	21.42
3/4	.010	9 5/16	83	202.4	16.745	28.0	23.52
3/4	.010	9 5/16	106	258.4	21.385	32.0	26.88
3/4	.010	9 5/16	140	341.3	28.245	39.0	32.76
3/4	.012	9 5/16	140	341.3	33.894	43.0	36.12
3/4	.012	9 5/16	140	341.3	39.543	47.0	39.48
3/4	.012	9 5/16	178	434.0	43.094	58.0	48.72
3/4	.017	9 5/16	140	341.3	48.016	52.0	43.68
3/4	.010	9 5/16	240	585.1	48.420	72.0	60.48
3/4	.012	9 5/16	240	585.1	58.104	80.0	67.20
7/8	.010	7 13/16	178	364.0	31.499	46.0	38.64
7/8	.010	7 13/16	240	490.1	42.470	70.0	58.80
7/8	.012	7 13/16	178	364.0	37.798	50.0	42.00
7/8	.010	7 13/16	306	625.8	51.150	78.0	65.52
7/8	.017	7 13/16	178	364.0	53.548	66.0	55.44
7/8	.014	7 13/16	240	490.1	59.458	84.0	70.56

SUMMARY OF HIGH-SPEED CUTTING TEST

Depth of Cut, in.	Feed, in.	Dia, in.	Rpm	Cutting Speed, fpm	Cu in. per min.
1/8	.0057	3 1/2	2240	2051	16.92
1/4	.0043	3 1/2	2240	2051	24.50
3/16	.0059	3 1/2	2240	2051	25.80

only, as shown in the photo at left.

The cutting material was Grade 78-B Carboloy, cemented to a 5/8x1 1/4-in. shank and held in place by our standard heavy-duty two-screw toolpost. The cutting edge of the carbide tip was ground with a chip breaker similar to that shown in Mr. Pitt's sketch.

The next experiment was made on a bar of SAE1045 steel, and results are detailed in the second table.

Test Piece Precooled

This test likewise was conducted cutting dry, as Mr. Pitt relates. However, we prepared our steel by submitting it to sub-zero temperature, in other words bringing it to roughly 5° below zero. This bar of steel was held at this temperature for 24 hr prior to the test. Our purpose for doing this was to assure, because we were cutting dry, that the cutting edge of the carbide tip was constantly kept cool, thus overcoming what Mr. Pitt experienced, namely, that the contact point wore away rapidly because of the high temperature and the terrific abrasive action which occurred at the cutting edge which caused failure of the bond of the carbide tip.

Our theory here in conducting the test was to keep the cutting edge of our carbide-tipped tool constantly in contact with the cold metal of our test piece, thus accomplishing, but in a more positive way, the same purpose that we seek when using a cutting coolant, that is to keep our cutting tool from extreme temperatures, which is practically impossible to do with coolant when turning at high speeds because of the centrifugal action.

Higher Speeds Possible

We feel sure that, from the results obtained, a considerably higher surface cutting speed can be obtained than the 2051 ft mentioned above. During this entire test we did not change our cutting tool, and on the last cut shown in the table the cutting tool cut for a distance of 24 in. without interruption, showed no visible signs of wear or tool failure, and produced a very high finish.

SHOP SHOTS

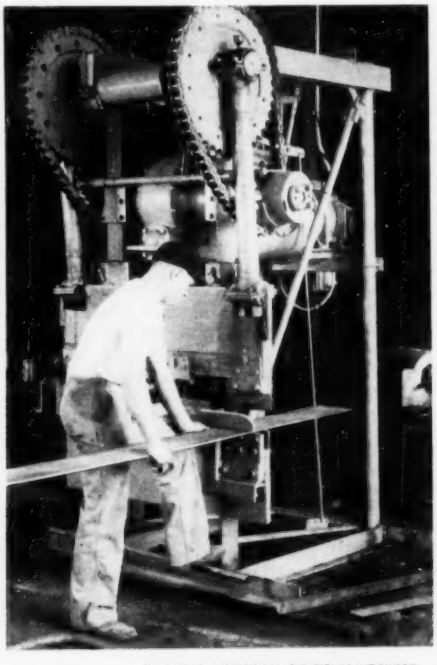
at

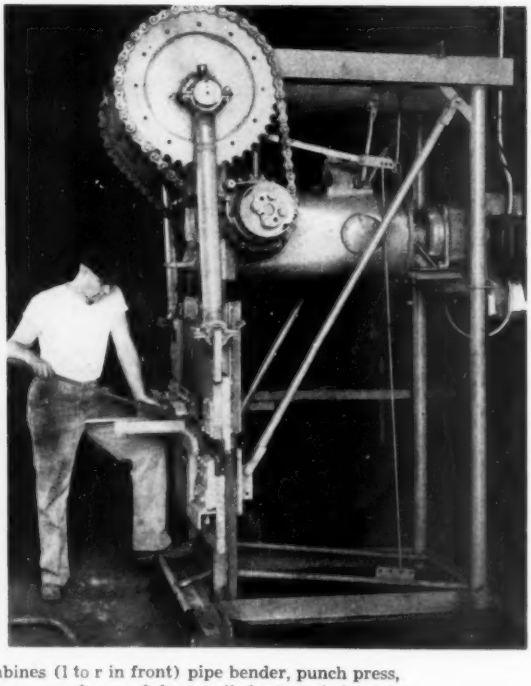
CURTISS-WRIGHT • JUDSON STEEL

GENERAL MOTORS

STRATHMORE MACHINE

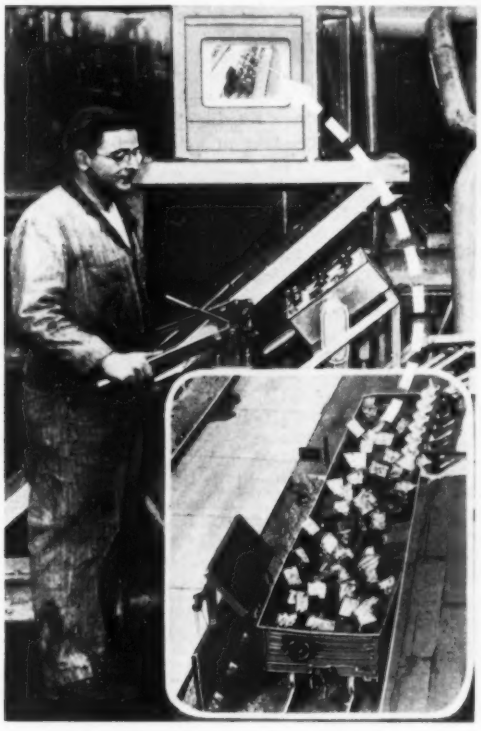
UNDERLIGHTING aircraft airfoil surface allows holes to be opened through the fabric covering to match holes drilled through metal frame. Idea by Keith Ault stops fumbling and experimental punching of extra holes; also permits use of awl so fabric threads are spread, not broken. *Curtiss-Wright Corp.*





HYBRID JOBBING-SHOP MACHINE combines (l to r in front) pipe bender, punch press, sheet bender, and metal shear. Ram is powered up and down rails by two chain-and-sprocket drives, oversize gear reducer, and electric motor. *Strathmore Machine Wks.*

HAND GAGE checks alignment of offset spotwelding electrodes when new electrode is positioned in machine. Idea by Claude Keller at Columbus, O., plant saves time and work spoilage by setting up welder to clear projections on work. *Curtiss-Wright Corp.*



DEFORMATION MILLER cuts corrugating rolls for machine that processes reinforcing bars that go into concrete. Adjustable-speed GE motor allows wide variations in cutting speed and in size of corrugations. Speed control is knob on top of motor (left). *Judson Steel Corp.*

←

EXCLUSIVE TV SHOW is for sole benefit of Ed Wilmans, scrap baler in Pittsburgh plant of Fisher Body, who watches scrap car fill up. Control panel operates automatic bale squeezer, conveyors, and car mover. *General Motors Corp.*

GOOD CARBURIZING PRACTICE

IX...Selective Carburizing Depends on Medium

Choice of the stop-off method is influenced by the penetrating power of the carburizing medium and the depth of case required. Factors that enter the problem of developing the correct case discussed

By T. A. FRISCHMAN, Chief Metallurgist, Axle Division, EATON MFG. CO.

A CARBURIZED CASE is often not wanted on some areas of a part. Yet carbon penetration is unselective; any surface exposed to the carburizing action will be enriched. This situation forces the shop either to machine away the case or to apply a selective carburizing method.

The machining of a quenched case is impossible except by grinding. For several reasons, it is impractical to machine unwanted portions of a slow-cooled (soft) case. Tool cost, extra handlings and time lost between operations to machine a slow-cooled case make this procedure expensive. In fact, this approach is seldom practiced in large-scale production.

Selective carburizing methods have certain limitations. These methods are: (1) copper plating areas where carbon penetration is unwanted, (2) covering an area with a copper band or cap, (3) applying one or more coats of a proprietary stop-off compound, and (4) not permitting solid carburizing compounds to touch the areas to be carbon free. Not all of these methods are suitable for use with all carburizing vehicles — solid compounds, gaseous mediums and liquid salt.

Gas carburizing is the most critical process in respect to efficiency of selective case control. Here, an adequate copper plating cycle is the surest and least costly method of achieving a complete barrier to carbon absorption, especially in large-scale production. Gas leakage past copper bands and caps, and through layers of stop-off paints is almost a certainty. Pack and liquid carburizing are not nearly so prone to penetrate protective covers and paints as the gaseous process.

Proof of these contentions is supplied by the results of certain tests. Copper plating in a cyanide copper bath for 15 min at 15 amp per sq ft provided effective stop-off for pack carburizing. When gas carburizing in a pit furnace equipped with circulating fans, the minimum effective plating time for effective stop-off was 90 min, if a 6-hr carburizing cycle, producing 0.040 in. case depth, was involved. For a case depth of 0.125 in., plating time was as high as 3 hr.

Further tests, made on 1¼-in. test pins of SAE 4620 steel, showed the effectiveness of copper plate as a stop-off for five different carburizing mediums in as many types of production furnaces. Test pins were ground and then plated in a cyanide copper solution for 15 min at 15 amp per sq ft. Thickness of plate was 0.00035 in. as measured with the Magne-Gage.

Carburizing mediums consisted of (1) solid compound, (2) liquid salt, (3) hydrocarbon liquid, or oil, (4) gas mixture consisting of equal parts natural gas and flue gas, and (5) carrier gas of 20% CO, 40% H_2, balance N_2; mixed with 10% natural gas. An accompanying table shows the carbon penetration that occurred for the three gas-carburized samples.

Copper plating is not a fool-proof stop-off unless a suitable procedure is applied to chemically clean work surfaces. The following method has been found effective for pack carburizing (the time being increased for gas carburizing to various

Case Hardness & Carbon Content at Various Depths

Depth below surface, in.	Carbon Content, %	ROCKWELL C Process A	Process B
0.0000	—	53.5	60.0
0.0025	1.17	56.5†	62.0†
0.0050	1.15	58.5	62.0
0.0100	1.10	61.5	63.0
0.0150	—	62.0	66.5
0.0200	—	64.5	67.0
0.0250	0.83*	66.0†	67.0†
0.0300	—	64.0	67.0
0.0350	—	62.0	64.5
0.0400	—	61.0	61.0
0.0450	—	—	—
0.0500	0.43	—	—
Total case depth 0.0680			

Process A: 1700 F, direct quench in oil.
Process B: 1700 F, direct quench in oil, reheat to 1525 F, quench in oil.
½ in. dia. samples. SAE 4620 steel. Carburized at 1700 F.
Total time in furnace, 13 hr. Carburized with a mixture of 50% natural gas and 50% flue gas. Continuous muffle furnace.

Notes:
*Evidently eutectoid composition as determined by maximum hardness.
†See accompanying photomicrographs for microstructures.

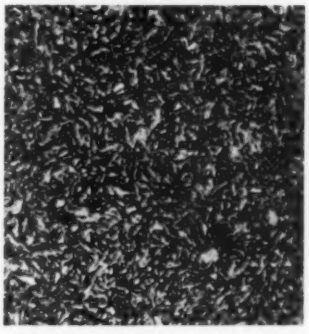
Carburizing atmosphere:
0.00% CO_2 32.80% H_2 0.20% O_2
11.60% CO 25.60% CH_4 Balance N_2

QUENCHED from 1700 F

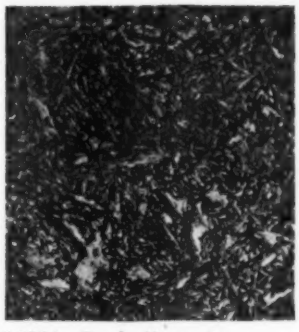
0.005-In. Depth—Retained austenite

0.025-In. Depth—Martensite

QUENCHED from 1700 F. Reheated to 1525 F; Quenched



0.005-In. Depth—Martensite



0.025-in. Depth—Martensite

Courtesy Timken Steel & Tube Co.

Retained austenite in the surface layers of direct-quenched work (upper left) prevents attainment of maximum hardness. This effect is produced by carbon content above the eutectoid composition. A reheating and quenching treatment diffuses the carbon and creates hard martensite throughout the case. All photomicrographs, 1000 X

depths, according to previous remarks):

Copper Plating Bath

Sodium cyanide....4.5 oz/gal.
Copper cyanide....3.0 oz/gal.
Sodium carbonate..2.0 oz/gal.

Conditions

Temperature ...100-110 F.
Current density.15 amp/sq ft.
Free cyanide....1 oz/gal.
Current source...6-v dc
Anodes .....Copper

1. Clean anodically parts to be plated for 2 min in proprietary cleaner compound solution made up 6 to 8 oz/gal. at 180 F; minimum temperature, 6 volts.

2. Rinse thoroughly in warm water.

3. Rinse thoroughly in cold water.

4. Acid dip 30 sec in 15% by volume muriatic acid, cold or room temperature.

5. Rinse thoroughly in cold water.

6. Copper plate at 15 amp/sq ft for 15 min.

7. Cold-water rinse.

8. Hot-water rinse.

9. Dry off with air blast.

Case Characteristics

The carburizing operation is not simply a matter of adding carbon to the steel for a given depth so the quenched surface will be hard and the core will be tough. Factors in producing the *proper type* of case are important to keep free of trouble both in manufacture of the article and later in service.

Type of case is important because so many other factors are dependent upon it. On the basis of carbon content, or degree of carbon enrichment (and nitrogen in some instances), a case may fall into any of three classifications. These are: (1) hypoeutectoid, (2) eutectoid and (3) hypereutectoid. To clarify these distinctions further, they may be defined thus:

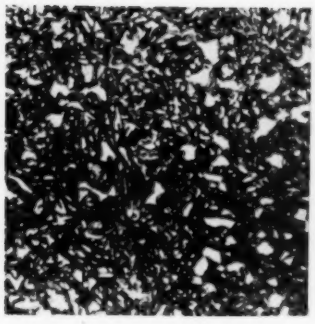
Eutectoid Case. This type of case contains the correct amount of carbon to transform the metal, upon slow cooling, from the austenitic condition (where the carbon is soluble) to the pearlitic stage, without throwing out ferrite (alpha iron) on the one hand or cementite (excess carbide) on the other. The eutectoid point of plain carbon steel is in the neighborhood of 0.85% carbon and somewhat less for alloy-type carburizing steels, depending upon the kind and amount of alloy added.

Hypoeutectoid Case. As the prefix suggests, this case is one with carbon content below the eutectoid composition. Upon slow cooling, a hypoeutectoid case will show pearlite with excess ferrite.

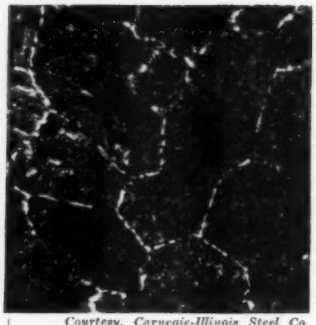
Hypereutectoid Case. Such a case has a carbon content in excess of the eutectoid composition. Upon slow cooling, the excess constituent is cementite, but the structure will also show some pearlite.

According to the American Society for Metals' *Handbook*, pearlite is a lamellar aggregate of ferrite and carbide. In other words, the solid-solution alpha iron or ferrite and the carbide or cementite transform from the austenite at the transformation temperature, upon slow cooling, into alternate layers. See Fig. 2 of "Good Carburizing Practice—I" (*AM*—Oct. 16, 1950, p 132). The white microconstituent is ferrite; the dark constituent is cementite or carbide.

These distinctions as to pearlite formation, or type of case, do not apply when the case becomes hard, as from quenching. All three types of cases can be made hard by quenching into suitable mediums, and all three can attain a Rockwell



Massive carbides may occur in direct-quenched steel, but are not harmful if the application is shock-free. SAE 4620 at 500 X



Courtesy, Carnegie-Illinois Steel Co.

Segregation of carbides at grain boundaries tends to weaken the carburized case. This microstructure was created by pot cooling the case and reheating. Magnification: 500 X

CARBURIZING PRACTICE *continued*

hardness of over C60.0 even though the carbon content may be above or somewhat below the eutectoid value. However, certain advantages are obtained by regulating the carbon content.

Additional factors enter into the problem of developing the correct case for the intended purpose. The more important ones are: (1) original microstructure, (2) chemical composition of the steel, (3) depth to which the case is produced, (4) carburizing temperature, (5) time of exposure to carburizing temperature, (6) carbon potential of carburizing medium, (7) carbon gradient or rate of decrease between surface carbon content and core, (8) quenching speed, (9) quenching procedure, quenched microstructure, grain size and subsequent reheating treatments, (10) hardenability of steel, (11) "corner" effect, (12) proper depth, (13) physical properties such as hardness, toughness, brittleness, stress distribution, (14) decarburization. The foregoing is a formidable list, not to mention the other factors concerning the problems encountered in operating the carburizing furnaces.

Microstructures

The most desired mircroconstituent of a carburized case is martensite. This is regarded as a supersaturated solid solution of carbon or carbides in alpha iron, forming instantaneously on rapid cooling from the parent austenite phase into an acicular needle-like pattern. Martensite is the hardest microconstituent formed from austenite.

The hardness of martensite varies with the carbon content, as does its resistance to certain types of wear. The hardness of martensite increases with carbon content up to a maximum at the eutectoid composition and then decreases as carbon content exceeds this value. While a martensitic case is inherently brittle, it nevertheless is very strong and can support the heaviest compressive loading of all microconstitutents with the least indentation.

Production of a completely martensitic case depends primarily upon the correct carbon content. As the carbon increases much beyond 0.85%, the chances for forming residual austenite, which is much softer, in the hardened case are materially increased. This is especially true in alloy steels. In general, common alloying elements markedly influence the retention of austenite. Where maximum resistance to wear is required, martensitic cases free from even small percentages of austenite are almost universally employed.

Remember that martensite does not always have the same appearance. It varies in degree of fineness, coarseness, lightness or darkness in color, width and thickness, and occurs in acicularly arranged plates or small, narrow needle-like formations. The appearance of martensite has much to do with the conditions of its formation.

Residual austenite in increasing amounts lowers the hardness of the case. In fact, if the percentage of austenite is high enough, a Rockwell hardness as low as C42.0 may be obtained unless preventive measures are taken. This will occur if a richly alloyed steel like SAE 3316, with 1.15% carbon, is direct quenched into hot oil or hot salt from a carburizing temperature of about 1725 F. Certainly such a microstructure will not wear well nor will it resist deformation under high unit stress.

With the leaner-alloy steels like SAE 8620 and 4620, it is still not easy to maintain a completely martensite structure when direct quenching cases over 0.060-in.

EFFECTIVENESS OF COPPER PLATE STOP-OFF

TYPE OF FURNACE	CARBURIZING MEDIUM	PENETRATION	HARDNESS, Rockwell C AT SURFACE	HARDNESS, Rockwell C ½ in. BELOW SURFACE
Continuous Pack (gas fired)	Solid Compound	None	21.0–22.0	22.0–22.5
Immersed Electrode (electric)	Liquid activated salt	None	20.0–21.0	20.0–21.0
Vertical Pit, Fan circulation (electric)	Hydrocarbon liquid (oil)	Six areas 0.030 in. deep	28.0–54.0	21.5–22.0
Continuous Muffle (gas fired)	50% flue gas 50% natural gas	Several places shallow	25.0–32.0	22.5–22.5
Continuous Pusher (gas radiant tube)	90% endothermic carrier gas 10% natural gas	Slight	24.0–29.0	22.5–22.5

depth from 1700 F into oil. Four accompanying photomicrographs compare the microstructures at depths of 0.005 and 0.025 in. from the surface, when the case is direct quenched from 1700 F into oil and when direct quenched as above, then reheated to 1525 F and quenched in oil. Hardness traverses and carbon analyses at various depths are reported in a table. Test pins, ½ in. dia, were ground to remove surface decarburization from mill treatment, then carburized in a continuous gas furnace along with production work. Carburizing medium was 50% natural gas-50% flue gas.

Carbon content above 0.83% produced low hardness at and immediately below the surface. Retained austenite in the direct-quenched case was the cause of this condition. At 0.025 in. depth, austenite is virtually absent, and the structure is needle-like, coarse martensite. Existence of a fully martensitic structure is consistent with a hardness of Rockwell C 66.

The reheating and quenching procedure reduces retained austenite at the surface (0.005 in. depth) to such an extent that the hardness is Rockwell C 62, instead of 58.5 for the direct-quenching treatment alone. Suppression of austenite and carbon diffusion are accomplished by reheating.

It is unfortunate, that direct-quenched work, unless surface carbon content is controlled, may exhibit a maximum hardness at a depth (0.025 in.) remote from the surface. If it is impossible or impractical to apply a reheating treatment, the occurrence of low surface hardness can be prevented or minimized by control of the carbon potential such as with certain carburizing gases, by use of reduced carburizing temperatures and case depths, and by diffusion. In short, control should be exercised to avoid raising the carbon content in the outer portion of the case above the amount that produces maximum hardness.

Two other carburized microstructures, usually unintentionally produced, are harmful in varying degree. When the structure contains excess carbides in the form of the discontinuous or massive types, the shock resistance of the case is lowered. However, if the carburized product is used in a shock-free application, the discontinuous massive carbides may actually retard wear due to extremely high hardness.

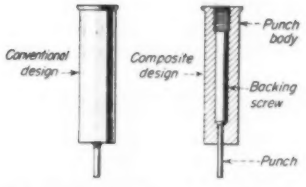
Massive carbides occur in direct-quenched structures, along with residual austenite, when the carbon is in excess of the saturation point of the austenite. And, these massive carbides will persist in reheated structures developed by the usual rehardening temperatures unless diffused otherwise.

When excess carbides separate out as networks outlining the original austenite grains, a more harmful structure is produced. The continuity of the brittle carbides surrounding the grain boundaries tends to weaken the case, so that it cracks or spalls.

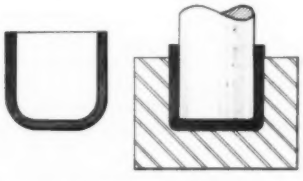
Another installment of "Good Carburizing Practice" will be published Mar. 19.

DIEMAKERS' KINKS

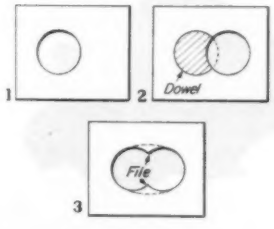
BY FEDERICO STRASSER



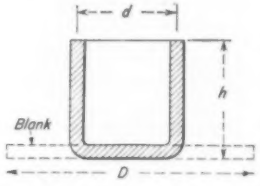
SMALL PUNCHES can be properly supported in a large body, and are less costly than if made in one-piece construction.



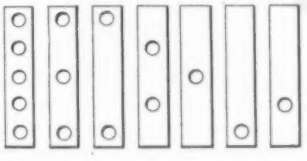
SQUARE-BOTTOM SHELLS are best made in two steps: first draw the shell with an ample bottom radius. Then put the shell into a squaring die to produce a flat bottom. Take into account that the shell is shortened in the squaring operation.



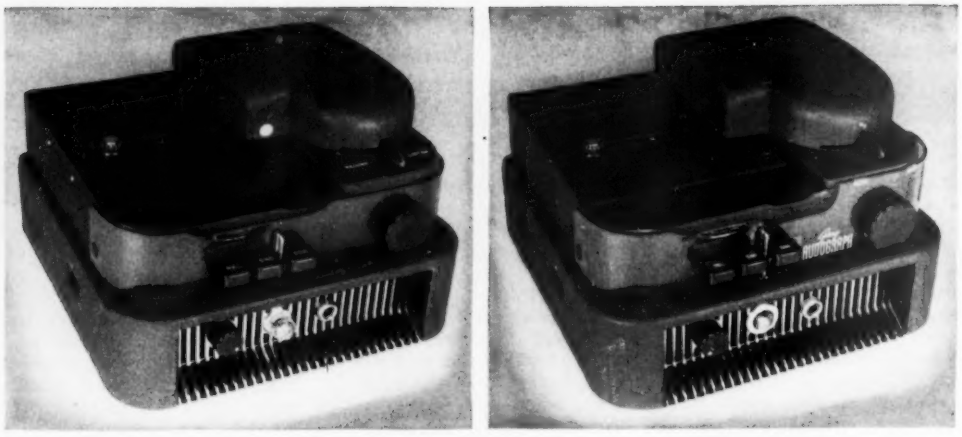
OVAL DIE OPENINGS are easily made in this way: Drill a hole, then press fit a dowel in the hole. Next move over to drill second hole to coincide with extremity of the major axis of the oval. Knock out the remainder of the dowel and file out the two small points.



SHELL BLANKS can be calculated approximately from the formula $D = 1.1\ (d + h)$, where D = the blank diameter. This formula eliminates square root computations in the traditional formula $D = \sqrt{d^2 + 4dh}$, and the error is only a few percent.



MULTIPLE piercing dies can be assembled so that identical-outline blanks with various hole patterns can be handled. Punches are removed from the die, according to the hole pattern required for a specific run of parts.



Many small differences have contributed to substantial cost reductions in the last model of the Audograph (right), although it bears a close resemblance to the earlier model (left)

REFINING METHODS SAVES 45%

COSTS TOO HIGH? Here's how a manufacturer of voice recorders set a record of dollar savings

BY H. E. LINSLEY, Associate Editor

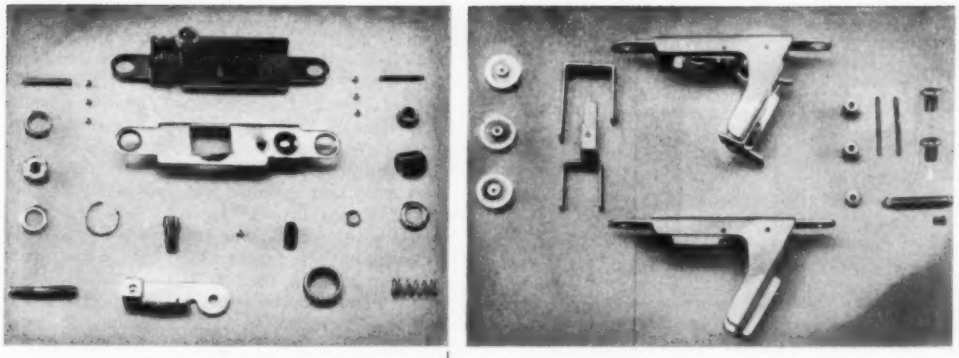
NO MATTER how good a product may be when first put on the market, there are usually ways in which it can be improved. When this is done, however, there arises the problem of retaining the basic design and preventing any increase in cost. Unlike the automobile, of which a new model is expected every year, some equipment is purchased with the expectation of a long service life, and any major changes — except at long intervals — may arouse serious customer resentment.

This was the case with the Audograph office dictation machine introduced by Gray Mfg. Co., Hartford, in 1947. Yet a carefully coordinated program of design, production engineering, assembly and service activities has made it possible to reduce manufacturing costs by 45% since that time. Meanwhile, useful life of the machine has been increased, performance improved, servicing operations made easier, and the rate of production steadily increased without effecting any major changes in appearance.

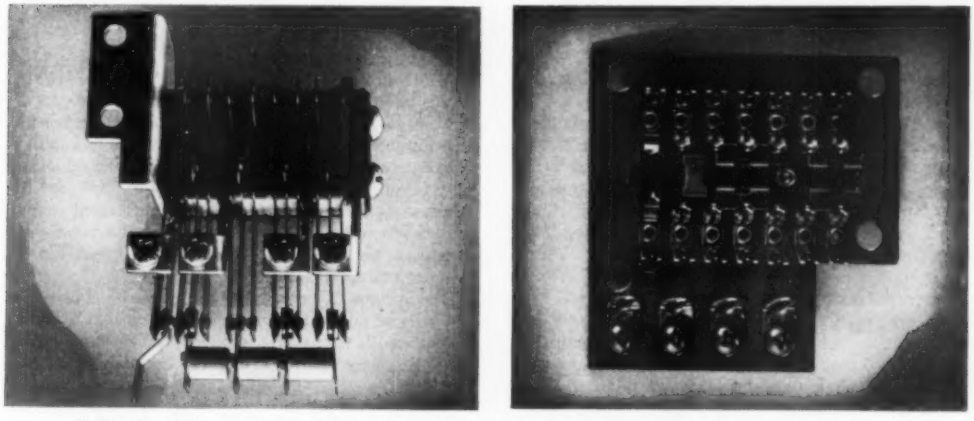
On the original machine the two parts of the main frame were sand castings. These have now been replaced by die castings, and many of the small holes are cast in. Flat, internal bosses are cast inside the frame for mounting the record-carriage slide rods to avoid drilling through the sides of the frame. Mohair strips are mounted on the top deck by strips of double-backed adhesive tape, and replace the original record support which consisted of seven small steel balls forced into holes drilled in the deck. At first, a liquid adhesive was brushed on, and although this was satisfactory from a performance standpoint, it was a messy job and necessitated an additional cleaning operation. The adhesive tape, dispensed from a motor-driven dispenser, has lowered production time 28%.

The plastic guide for the index strip was formerly fabricated from vinylite sheet by bending under heat, and fastened to the frame by four spacers. Now it is molded of Plexiglas in one piece, ready for installation, and incorporates a redesigned cutout to simplify use of the index strip. Also, the "Audograph" name and the "Record" and "Listen" titles are incorporated in the mold, eliminating the expensive hand engraving formerly done on the metal frame.

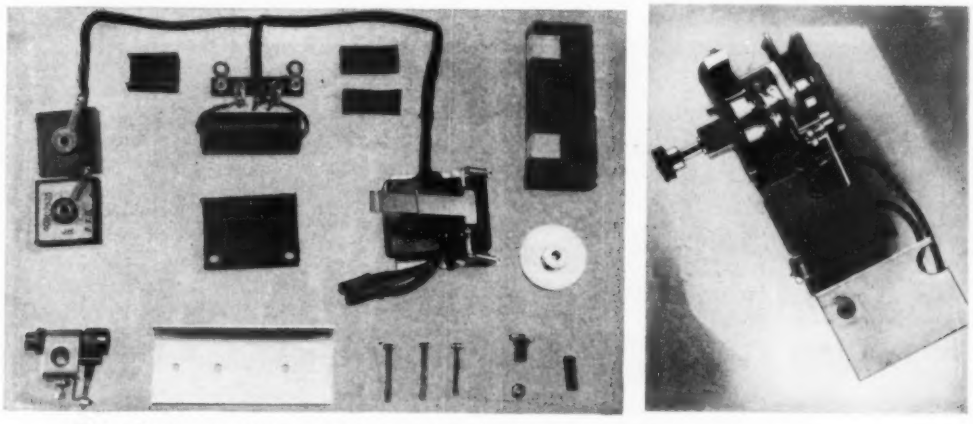
Other, less-obvious, changes include production of knobs and buttons in multi-cavity molds for a 90% cost reduction, and mounting the record-listen lever with a dowel and one self-tapping screw in place of two machine screws which necessitated a tapping operation. The volume indicator light was changed from a locknut type, requiring a separately installed resistor, to a snap-in type with a built-in resistor. The indicator light was reduced in size and moved to the front of the top cover, with color coding added to indicate record or listen positions. Finally, painting the inside, with attendant masking of screw holes



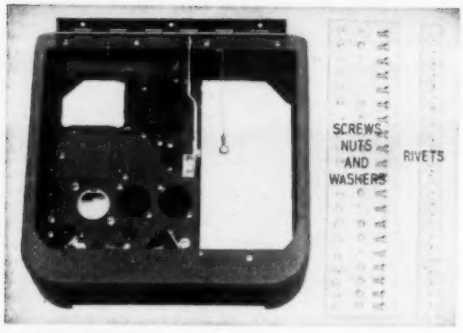
Record pressure roller on the old machine (left) was a fairly complicated assembly, expensive to produce. Newer model (right) has fewer parts, is cheaper to make and improves recording fidelity



Multi-pole switch, as originally designed (left), required delicate adjustment and gave trouble in service. When redesigned (right) it formed a rugged, trouble-free unit and cost 30% less



Old-type backspace unit operated through the control system and was an awkward wiring and assembly job (left). New single-unit type (right) functions through the record spindle and is preset and adjusted before installation



Machine riveting of amplifier components into the chassis brought about a saving of 20% over the original method of assembling with screws, nuts and washers. Items so attached are those which are not subject to wear or to the probability of replacement

SAVES 45% *continued*

and working surfaces, was eliminated when smooth die castings were substituted for sand castings.

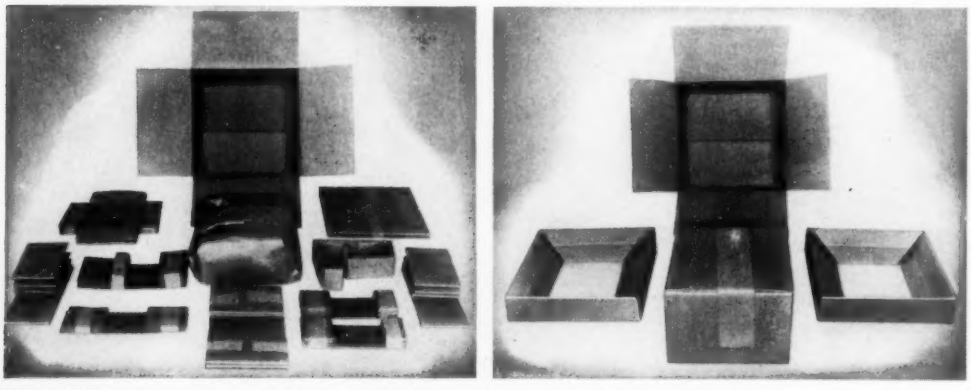
An interesting mechanical change has been made in the mechanism used to maintain constant, regulated pressure of the record disk against the recording and reproducing styli, regardless of thickness variations. The original unit was composed of 23 individual pieces and employed only one roller. The latest model provides support with two rollers mounted on a pivoted yoke that has lateral freedom under spring tension. This provides an allowance for lateral and vertical motion within the desired close limits, but avoids the necessity for manufacturing the components to expensive, close tolerances.

The electrical switching mechanism for automatically selecting the reproducing and recording functions of the amplifier consists essentially of a multipole switch. The original leaf-type model required adjustment after installation, and had to have a guard attached to it to prevent injury to the leaves and disruption of the adjustment while passing through production. The new type has a one-piece Bakelite body, solid silver contacts, and a self-cleaning, wiping action. Correct contact pressure is established when the switch is made, so adjustments are not required and guards are unnecessary. The change resulted in a 30% reduction in material cost, a 25% reduction in labor cost, and eliminated all field service on this particular item.

The recorder-reproducer subassembly is another example of improved methods reducing manufacturing costs, although operators' take-home pay has steadily increased. The original production plan was based on straight piecework and involved 49 separate elements, requiring 0.77 hr for complete subassembly. Average operator bonus was $0.15 per hr. From this was developed a line-assembly system whereby the number of elements was reduced to 41, time was cut to 0.65 hr, and operator bonus rose to $0.25. In its final form, improvements in jigs, fixtures and assembly methods brought about a reduction to 35 elements, cut the time to 0.5 hr, but raised the bonus to $0.35 per hr.

Changes of this nature require careful engineering, but of even greater importance is the manipulation of production schedules to avoid overproduction of many of the small items which are to be discontinued. If some of these are purchased items, adequate time should be allowed for the vendor to terminate his production run, and thus avoid penalties for scrapped work in process.

The service department should also be consulted, not only to suggest improvements, but also to voice objections. It frequently happens that designs which are quite sound from an engineering standpoint are liable to introduce complications not readily apparent to anyone but a service man who has had to make adjustments in the field. And sometimes these changes may introduce unwarranted maintenance costs.

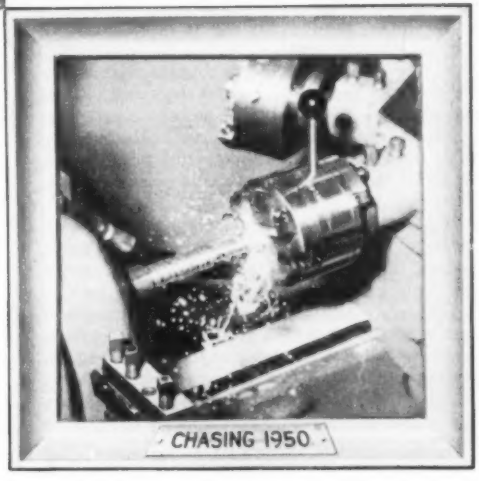


Packing labor costs were reduced 66% and substantial savings made in materials when a new, suspended carton packing (right) was introduced to give double carton protection. The original packing (left) gave only single carton protection and required ten inserts

Thread Chasing...

...how to do it

BY WM. M. STOCKER, JR.
ASSISTANT EDITOR



THREADING is one of the most difficult operations in Metalworking, but it has been a stepchild until recent years. Only a half century ago, thread chasing was done by hand, with a multi-toothed comb (really a single chaser) on a long handle. It was faster than single-point threading in a lathe, and frequently more accurate, because leadscrews were then so inaccurate themselves that "file and fit" was standard practice. Exact duplication was a phenomenon, not the rule.

But accurate threads are essential for interchangeability and interchangeability is the basis for mass production. So threading tools have come in to their own, and threading techniques have been vastly improved, particularly in the last 20 years. Threading is still an art—but one in which we are beginning to learn the rules.

Today, six processes are commonly utilized to make threads. They are:

1. **Single- and multiple-point cutting**
2. **Solid adjustable or button dies, and solid taps**
3. **Self-opening dieheads and collapsible taps**
4. **Thread rolling**
5. **Thread milling and hobbing**
6. **Thread grinding**

Casting, forging, diecasting and other processes are used, but are exceptional. This first Report will deal with external-chasing methods only—the first three listed above; the others will be described in later Reports. In each case, we explain the method and the tools, show how and where each is preferable.

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES

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How the Chaser Operates

Screwcutting on the lathe, using a single-point tool controlled by a leadscrew, is probably the most widely known method for producing a thread. It is also the root from which has grown all other chasing tools. The toolbit is ground freehand, to a gage, or in an adjustable fixture, to the dimensions of the desired thread. Clamped firmly in the toolpost, the bit traverses the length of the workpiece; thus takes the first cut. The bit is then backed out of the cut, returned to the starting point, and restarted on the second cut. This process is repeated until desired thread depth and form are reached. Thread pitch, and degree of accuracy, are wholly determined by the pitch and quality of the lathe leadscrew. (In some machines, the leadscrew may be replaced by a cam or hydraulic feed).

Now, if that single toolbit is coupled with a few more to form a gang tool, each bit staggered to take a following cut, the number of passes necessary to complete the thread will be reduced as the number of tools is increased. But there must be sufficient clearance at the end of the thread to permit the last tool to complete the pass.

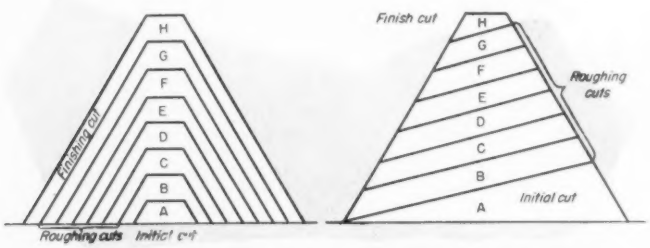
If 24 passes are needed to complete a thread with a single-point tool, 24 tools will be needed to finish the thread in one pass. This would, however, mean a very long gang, and the loading on one side of the workpiece would be tremendous. So the modern custom is to distribute tools around workpiece. Such "gangs" are called multiple-point tools. Rather than a series of individual bits, the thread form is usually repeated a number of times in one solid piece. Space saving, rigidity, accuracy, and control are just a few of the reasons for this.

Further, if the 24-bit tool is divided into four parts, with each progressive single cutting edge spaced around the periphery of a circle, the result is a die for external threads and a tap for internal. The workpiece is completely threaded in one pass. One multiple-tool will contain single tools number 1, 5, 9, 13, 17, and 21. The next, 90° in the direction of rotation, will consist of 2, 6, 10, 14, 18, and 22, and so on around the periphery. Loading, on the workpiece, is approximately equal all around. When these multiple-tool units are removable, they are called "chasers." In this case, four chasers comprise one set. The holder is called a "diehead"; represents the toolholder used with single-point tools. Units which have all of the "bits" in one solid, circular piece are called solid dies, button dies, or solid taps.

Of course, this is the simplest form. Many variations are provided to improve threading action. Chasers having nothing but cutting teeth must still be guided by a leadscrew or equivalent. However, leading or spare teeth, which are dull, are usually added to a chaser. These will follow the previously cut teeth; make the chaser self-leading.

Actually, the cutting teeth of a chaser, die, or tap are its chamfer and first full tooth for finishing. The remainder of the teeth are for leading only; do not cut. If these remaining or following teeth do cut, shaving of the chased tooth form may result. Cutting edge frequency is determined by chamfer length which, in turn, is determined by the clearance provided on the threaded part. Long chamfers mean more cutting edges (on tool passes) per full tooth, hence less tool load. This is always desirable.

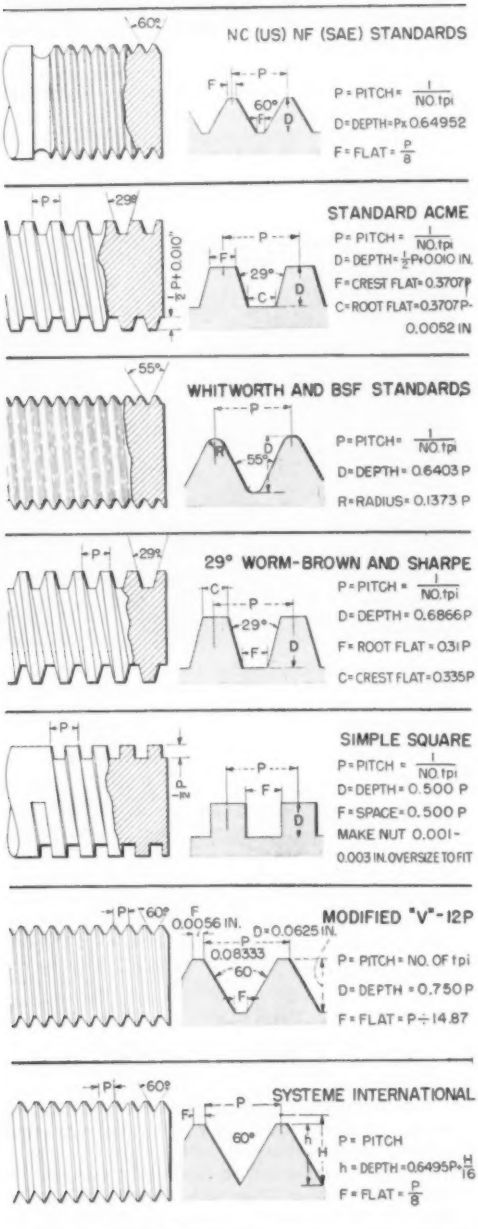
Thus, solid dies, taps, and button dies, as well as collapsible taps and self-opening dieheads, using chasers of various types, perform the same operation in the cutting of a thread form as the single-point toolbit. Thread chasers are a series of single-point toolbits, operating side by side, and arranged radially or tangentially about the periphery of the part.



Single-point threading **Diehead or tap threading**

Chaser threading differs from single-point threading only in that the chip form removed is different. On a set of chasers, the first full tooth is the cleanup tooth. It cuts only the difference between the root of the full thread form and the partial form of the preceding chaser-tooth

THREAD FORMS COMMONLY USED . . .

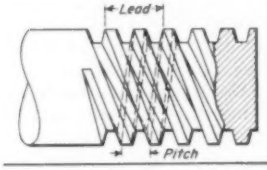

60°
N.C (US) NF (SAE) STANDARDS
P = PITCH = 1/NO. tpi
D = DEPTH = P x 0.64952
F = FLAT = P/8
29°
STANDARD ACME
P = PITCH = 1/NO. tpi
D = DEPTH = 1/2 P + 0.010 IN.
F = CREST FLAT = 0.3707 P
C = ROOT FLAT = 0.3707 P - 0.0052 IN
55°
WHITWORTH AND BSF STANDARDS
P = PITCH = 1/NO. tpi
D = DEPTH = 0.6403 P
R = RADIUS = 0.1373 P
29° WORM-BROWN AND SHARPE
P = PITCH = 1/NO. tpi
D = DEPTH = 0.6866 P
F = ROOT FLAT = 0.31 P
C = CREST FLAT = 0.335 P
SIMPLE SQUARE
P = PITCH = 1/NO. tpi
D = DEPTH = 0.500 P
F = SPACE = 0.500 P
MAKE NUT 0.001 - 0.003 IN. OVERSIZE TO FIT
MODIFIED "V" - 12P
0.0056 IN.
D = 0.0625 IN.
0.08333
P = PITCH = NO. OF tpi
D = DEPTH = 0.750 P
F = FLAT = P ÷ 14.87
SYSTEME INTERNATIONAL
P = PITCH
h = DEPTH = 0.6495 P = H/16
F = FLAT = P/8

Threading by single-point tool is obtained by a combination of the rotary motion of the work with the longitudinal, translatory motion of the lathe carriage. This carriage motion is provided by the leadscrew, which, by relating its own rotary speed to the rotary speed of the workpiece, gives the thread-in-process its pitch. Leadscrew rotary speed, relative to workpiece speed, is determined by "change" or threading gears within the lathe headstock. The leadscrew also determines the carriage feed.

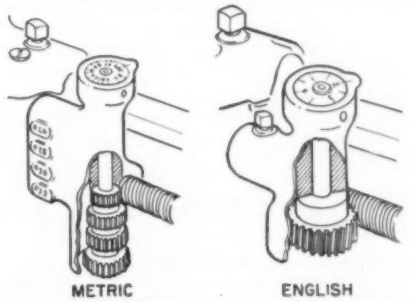
If the leadscrew has eight threads per inch, which is common, and the gears are arranged so the headstock spindle revolves four times while the leadscrew revolves once, the thread cut will be four times as fine as the leadscrew pitch, or 32 tpi.

The toolbit is ground to the shape required for the threadform to be cut, such as, American National, V-thread, Acme, Square, Whitworth, Dryseal, or International Metric. Threads of opposite hand may be cut by reversing the direction of leadscrew rotation.

Multiple threads are cut by dividing the faceplate into equal parts according to the number of threads desired, such as double, triple, or quadruple thread, and then milling a slot or inserting a dowel pin at each division. The lathe dog is then clamped to the workpiece, set in the first slot, and the first thread is completed. The dog is then advanced to the next slot (without removing dog from workpiece) and the second thread is completed. This is repeated



Multiple screw thread having two grooves (double thread). Thread lead is twice the pitch. Rule: Multiple thread lead = pitch × No. of starts



Thread dial indicators are used to speed threading operations; permit disengaging half-nuts, moving carriage, and reengaging leadscrew at proper point to continue threading. Metric indicator is more complicated than English system requires

until the multiple thread is complete. Another method is to mark the number of starts evenly around the periphery of the workpiece. Then, start at number one, complete the thread, release the change gears, move to position two, engage the change gears, cut the second thread, and repeat until the piece is completed. Leadscrew must not be turned while change gear is released. Precision dividing faceplates of various kinds are available for accurately marking and starting each new thread.

Thread dial indicators, for both English and metric system threads, are used to save time. They are especially helpful when cutting long threads. When the lathe is set up for cutting threads, the thread dial indicates the relative position of the leadscrew, spindle, and carriage. This permits disengaging the half-nuts from the leadscrew at the end of a cut, returning the carriage quickly to the starting position manually without reversing the lathe spindle, and reengaging the half-nuts at a point which will assure the tool following exactly in the original cut. The metric device is considerably more complicated than the English indicator.

Why Use Single-Point Tools?

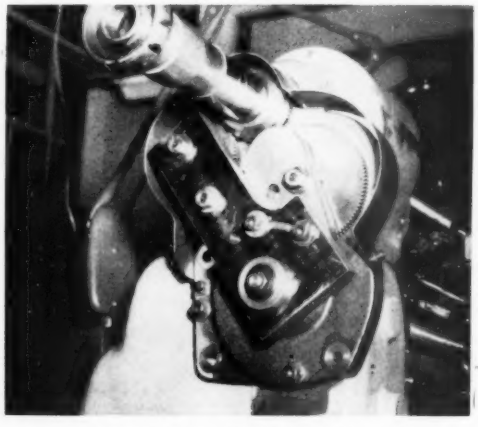
Aside from convenience—the fact that almost every shop has a lathe available for routine threading operations—the primary reason for deliberately doing engine lathe threading is accuracy. A very close second reason is versatility, at minimum tooling cost, and the third reason is size. The lathe provides a means of cutting threads and worms on pieces much larger than other threading tools can handle. Where high-production quantities of standard parts are needed, conventional single-point lathe threading is seldom practical. However, a special single-point unit for nigh production is available.

Thread lead on a workpiece can be no more accurate than the lathe leadscrew. However, modern lathes are usually equipped with leadscrews having much greater accuracy than is required for ordinary, even close, threading operations. When extreme accuracy is necessary, special precision leadscrews plus extra long, precision half-nuts are used. Lead error compensating threading gears are also used when necessary.

Wear on the leadscrew is very slight when the lathe is properly lubricated. Threading difficulty is seldom caused by inaccuracies of leadscrew lead.

"Cam action" of the leadscrew or the headstock spindle is more often the cause of inaccuracy in threading. It is the condition resulting from out-of-square, worn, or inaccurate thrust bearings and produces, not inaccurate lead, but what is known in the shop as a drunken thread. Usually, the difficulty is easily traced and corrected.

Improperly adjusted gearing can cause poor threads. If gear centers are too far apart there may be enough play, or backlash, between the gear teeth to cause jumping, as the gears revolve, which probably will affect thread accuracy. It is corrected by simply adjusting gears to mesh properly. Diametral-pitch worms and other threads having unusual pitch will sometimes present a gearing problem. Occasionally an approximation is used which can usually be avoided by using compound gearing. An example of approximate gearing is the setup required when metric screw threads are cut on lathes with English-system leadscrews. For most practical purposes the threads cut are entirely satisfactory.

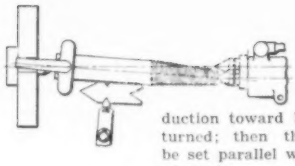


Leadscrew compensating gear train is used with a precision master leadscrew when cutting precision threads. Gears are carefully matched and fitted to lead or lag a predetermined amount as needed to offset lead-screw variations

Fixtures, Rigidity, and Chip-Load

Threading is an operation which must be given considerable thought. Chasing cannot be considered to follow exactly the same rules as general turning. Chasing is done with a tool which has been shaped to produce a special form in the workpiece; tool strength is sacrificed to accomplish this. Accurate threads depend upon certain conditions:

1. The lathe must be level and true all around; should be checked regularly. Any warp or twist will be transmitted to the thread.
2. Workholders should be substantial for the size of the workpiece and the cutting load to be applied. They should not permit slippage or chatter for lack of grip or power, and must hold the work truly on



Taper threads are cut with tailstock center moved toward operator for reduction toward headstock. Taper is turned; then threaded. Tool *must* be set parallel with straight portion of work

center. Probably, between-centers threading, collet holding, and the 4-jaw independent chuck, in that order, are most suitable as workholders. The 3-jaw universal chuck is seldom sufficiently accurate, unless the jaws are especially bored for the work-diameter to be threaded. Steadyrests, either center or follower design, should be used according to the work-diameter and length of overhang.

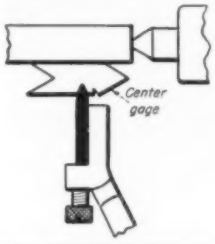
A rough, rule-of-thumb indication of this need is provided by laying a straightedge along the angle setting of the compound rest or perpendicular to the cutting face of the tool when the tool is fed straight in. This should be done with the tool at the free end of the workpiece. If the straightedge edge falls outside of the chuck diameter, at the chuck, a steadyrest is probably necessary. The follower rest should always be used when threading small-diameter work.

3. Remember that the threading tool is designed primarily to form metal and only secondarily to remove it efficiently. Sharp-pointed tools will not withstand the chip loads common in straight turning operations. Loads applied to the tools must be in proportion to the smaller area which must carry the cutting load. That is why general practice is to thread at speeds 1/5 to 1/3 those used for straight turning and boring. Cemented carbide tools permit a considerable increase in cutting speeds. This gain is limited only by the ability of the mechanic or the machine quickly to stop the tool from jamming at the end of each cut.

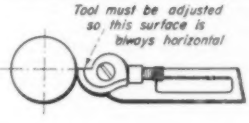
4. Toolholders must be strong, rigid, and well made; of a size proportional to that of the workpiece. Excessive overhang, or projection, of either the toolbit in the holder, or the holder in the toolpost is objectionable; invites slippage and chatter. The toolbit, for roughing, must clamp securely in the holder and the holder be held firmly in the toolpost. However, a better finish is obtained if the tool is permitted some "spring" during finishing.

To set the holder, first adjust the toolbit so only a trifle more than the ground portion projects beyond the holder. Then, set the holder in the toolpost and adjust the toolbit point vertically, to the exact center of the workpiece. Place a center gage with its back edge in contact with the work, or the tailstock spindle. Adjust the tool horizontally by fitting the tool point *exactly* into the proper angle notch in the front end of the center gage. If 29-30° compound-rest angle is used, this should be set prior to centering tool point with center gage. Internal threading requires additional front clearance over external threading to prevent heel of tool from rubbing. The top of the cutter bit should be set at exact center and a boring bar of the largest practical diameter used to provide maximum rigidity. Bar clearance, nevertheless, must be sufficient to permit backing tool clear of thread. Lefthand threads, internal or external, will have more tendency to chatter or runout as the cutting action is away from the headstock. Toolholders especially designed for threading, as well as formed threading cutters ground to US Std and 60° "V" point are available.

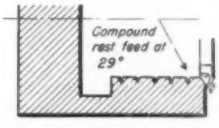
5. Coolants are of special value in threading operations. They keep the sharp tool tip from welding to the work or burning, they improve surface finish, and, by keeping the workpiece cooler, minimize distortion. For steel, lard oil is generally considered to be a good coolant. Combinations of lard oil and mineral oil come second, and a mineral-oil, soluble-oil mixture last. Mineral oils having a high sulfur content will work more effectively and sulfur is sometimes added to lard oil to improve its action. A fluid mixture of lard oil, white lead, and carbon tetrachloride is sometimes helpful when threading stainless steel. However, materials such as white lead, carbon tetrachloride, and sulfur should be used with caution. They can have a toxic effect on the user; can produce dermatitis. Generally speaking, lighter



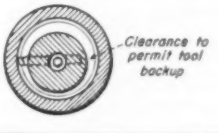
Center gage must be held parallel to machine bed ways, or square with work, when setting any thread tool



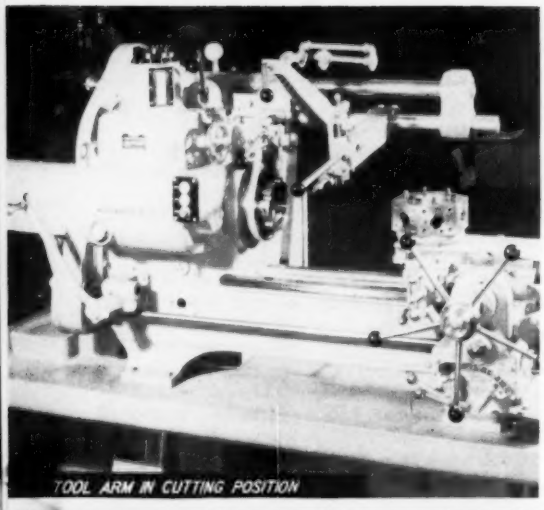
Formed threading cutter or standard toolbit, top of tool is flat; must be horizontal and exactly at center of work

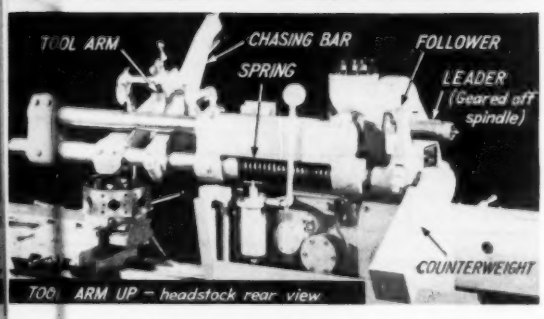


Internal threading, with boring bar and bit, is also improved if compound rest is set at 29° to perpendicular position



More front clearance is required when threading internally to prevent heel of tool from rubbing and to clear chips easily





Overhead threading attachment for turret lathes, to speed single-point chasing of non-ferrous metals is mounted at rear of turret lathe headstock. It extends a screw-adjustment slide toolholder to right of spindle. Maximum threading length cut at any one time is 4¼ in. Pitch is obtained by a spindle-driven leader and change gears, in a leader-follower combination. Chasing tool arm swings up (counterweight) to clear thread and is returned longitudinally by compression spring for next cut or next piece. A brake is furnished to be attached to headstock with a belt loop around chuck to further speed cycle

fluids are used with soft metals and more viscous fluids for hard metals. For example, kerosene is used for threading aluminum, and sulfur base mineral oil is the coolant for chrome steel. However, cast iron is usually threaded without coolant. Many commercially blended coolants are available under various brand names. These are carefully prepared to suit certain predetermined needs; should be considered, especially for production threading.

Single-points for Production

Special machines and fixtures make it possible to perform single-point chasing operations at speeds far above those in conventional practice. These produce threads with the accuracy that is only obtainable with lathe-chased threads, but at a reasonable production cost.

Lathes are fitted with automatic fixtures which control both the action of the carriage and the cutting tool feed, from start to finish of cut. Efficiency is increased by utilizing both the forward and reverse motion of the work with the cutting tool shaving one side of the screwthread as the carriage is fed from left to right and another cutting tool shaving the other side of the thread as the tool is fed from right to left. A front and a back tool on the cross-slide make this possible. The latter, of course, is practically multiple-point chasing. But not quite; only one tool cuts at a time.

A thread tool attachment is available which can be used on any screw-cutting engine lathe. This tool is actually a holder for a 10-tooth cutter with means for indexing the cutter to present each of the 10 teeth successively to the work, and with adjustments for controlling finished thread size.

The cutter is a disk of HSS containing ten teeth, each tooth having a prescribed increase in radial length over the preceding tooth. Thus, it comprises, in effect, 10 single cutting tools. Progressively, in 9 heavy measured cuts, the first 9 teeth rough out the thread. It is then finished by using the tenth tooth. Development of the thread groove is governed by the tool itself, rather than by the operator. Operator responsibility is reduced to indexing the cutter when reversing the lathe.

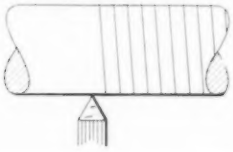
As the form and size of each thread pitch is determined by the cutter, a separate cutter is required for each pitch and form. Each cutter, however, will cut its pitch and thread form on any diameter up to four in.

The cutter never needs to be ground on the sides and requires sharpening about 1/100 as often as its single-point counterpart. The lathe can be speeded up and heavier cuts taken because the tool cuts almost entirely with its flat face. It is so simple and foolproof to operate, once set up, that unskilled labor can readily produce accurate threads.

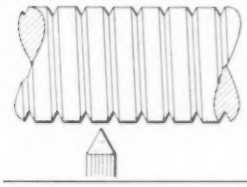
Special machines are also built to make use of the advantages in single-point threading. One of these is the precision screw-chasing machine. It resembles a long-bed engine lathe, but is designed expressly for chasing threads. Screws can be chased up to 9 in. dia and 15 ft long; right or left hand, single or multiple start up to and including a 3-in. lead. A particularly low work speed range provides the slow work rpm required for large-diameter screws and by such materials as nickel molybdenum.

Significant design features of the chasing machine are:

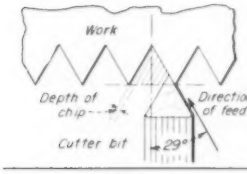
1. Steadyrests mounted on the bed, thus permitting clear passage of the tool along the full length of the screw without interference.
2. A leadscrew variating attachment to correct previously determined lead error during the final chasing operation.
3. Machine leadscrew in center of bed, running in oil bath, and on special roller-bearing support.



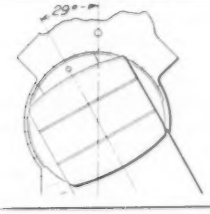
Check setup prior to cutting thread by taking very light cut across work



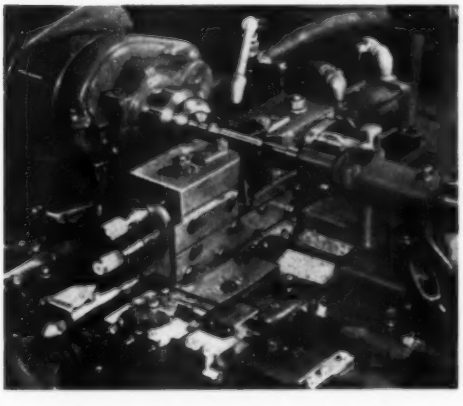
To reset tool, if interrupted, adjust cross-feed and compound rest feed until tool enters exactly into groove. First, however, take up all backlash and lost motion



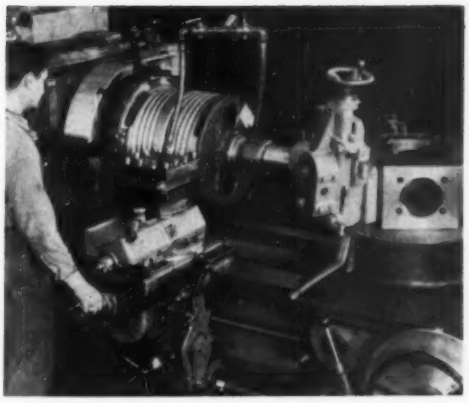
29° angle setting minimizes chatter and improves finish. Most of chip-load is toward headstock; right side of tool just shaves thread smooth



Proper angle setting for compound rest when thread cutting



Front and back tools in this attachment, for single-point threading, halve threading time. Front tool cuts length, is then retracted and back tool is engaged, workpiece rotation is reversed and back tool cuts on return pass. Both directions of travel are utilized to cut threads

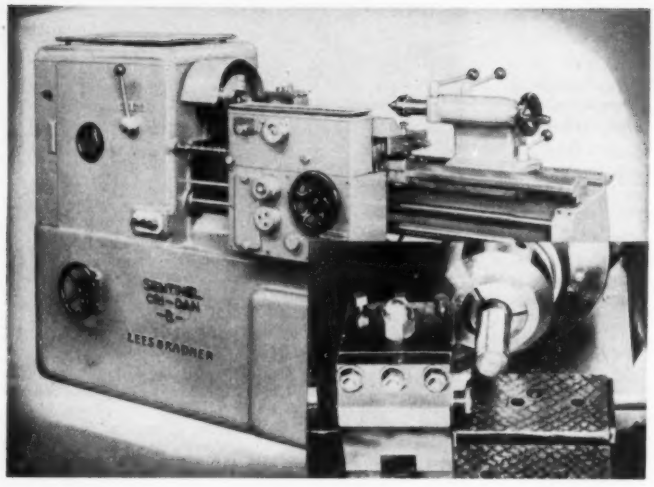


Cable drum grooves are not truly screwthreads, but they offer similar problems. Here the drum is chucked on the inside with a 4-jaw combination chuck and supported from the turret with a live center. Grooving tool is run into cored slot for proper depth, spindle is started, and cross slide carriage is given a very coarse feed. Electric brake stops spindle within less than ⅛ in. of locking groove center. Left-hand groove is turned by simply resetting tool and reversing carriage feed

Leadscrew variating mechanism was originally developed for moldmakers, to compensate in molds for shrinkage in material being molded. Nevertheless, it is useful in all operations requiring accurate leadscrew control. Range of variation is 0.033 in. of increase or decrease in lead per inch. This is obtainable over a 12 in. length of thread. For tool work, leadscrew variating can compensate for shrinkage after heat treat or produce odd leads and metric threads with standard gear box settings

4. Machine leadscrew finished chased within a limit of ± 0.004 in., non-accumulating, in its 15-ft length.

Leadscrew variating mechanisms are available on engine and toolroom lathes as well. This device solves a number of threading problems very simply. For example, if a workpiece is chased and then heat-treated it may shrink upon cooling. By utilizing the variating mechanism, compensation can be made for this shrinkage during chasing and upon cooling the thread lead will be correct. Also, when odd leads must be chased, standard gear settings can be made and the 0.033-in. variation adjustment used to obtain the desired lead. Often this will offset special change gears; simplify metric threading.



From France comes the Cri-Dan machine, now available in the U.S. In addition to the machine shown (4 in. dia), there is also a 12 in. dia model. Cutting action is controlled by an extremely accurate master lead cam and change gears. Infeed is also cam controlled. The principle is built around the advantages of single-point tools and cams. Any thread, right or left-hand, single or multiple, and any form that can be ground on a tool can be cut. Changeover time from job to job averages 15 min. Tool traverses through cut at up to 100 passes per min. Cylinder head stud (insert), is SAE 4140 heat-treated, 1.0 in. dia, 8 p, 2.0 in. thd length. Threaded at 800 rpm with single carbide tool, part is completed in 48 sec

Another advent in single-point chasing is more than a machine; it is also a new technique. This was developed by the French, is now available in the United States, and is called the Cri-Dan principle. Rather than a leadscrew, the machine utilizes a master lead cam and change gears. Threading is done with a simple single-point carbide or HSS tool ground from a standard blank. The method is to take multiple passes automatically across the workpiece while feeding the tool in, with each pass, the proper depth for the materials and tool being employed. When the tool reaches the desired full thread depth, the cycle is automatically stopped.

Changeover of the Cri-Dan machine, from one job to another, averages 15 min. Heavy-pitch as well as light-pitch threads are feasible. Straight, tapered, and multiple internal or external threads are readily produced. It is also possible to generate almost any thread profile as a result of the versatility of the single-point tool. If design requirements make it absolutely necessary, actual square threads can be cut. However, experience has taught that a modification of the sharp square profile will lead to a little stronger section plus much enhanced tool life. Fillets or undercuts are not needed as the cutting action of the single-point tool permits the thread section to be brought right up to the shoulder. Automatic cam withdrawal of the tool offsets jamming it into the shoulder.

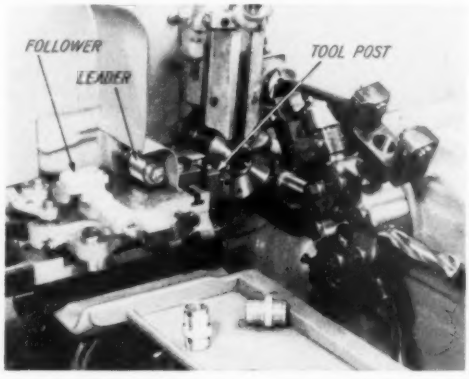
Threading speeds are considerably higher than with a conventional lathe. The cutting tool traverses the cut at speeds up to 100 passes per min.

Single or multiple-point tools may be used on this fully automatic threading attachment for screw machines. Cam actuated, lead is obtained by leader-follower combination shown. Tool is particularly suitable for positions where threading die will not reach (behind shoulder), and threading can overlap with an internal operation. Accuracy of leadscrew threading is another advantage. Aluminum cannon plug (circle) is completed in 35 sec per pc, including threading

Multiple-Point

Somewhere between single-point cutting and diehead threading with chasers is the multiple-point threading that dates back to the chalk and comb-chasing (now sold as "hand chasers") days. There is seldom any need for these tools in modern threading practice, but when that occasional use arises single chaser tools are very practical. By combining the accuracy of single-point threading with the speed of multiple cutting, they are a special production tool. Prior to the present-day accuracy of dieheads, multiple-point cutting was more widely used. The tool should be used with a lead mechanism, either screw or cam, to provide maximum accuracy. It should be considered for jobs where a chasing operation can be performed while another operation such as drilling or boring is being accomplished. Soft, non-ferrous materials such as aluminum, brass, or copper can be threaded in one pass with a 4- to 6-point tool.

Tool construction is comparatively simple, but



sufficiently expensive to warrant a reasonable production demand before making this choice. Design data must include the material to be chased, the infeed per revolution, whether the thread is against a shoulder and if so, the amount of clearance, and the permissible maximum number of passes. Of course, the thread dimensions must also be known. The thread form is ground into a hardened tool steel or carbide block, as many points as needed to suit the job and as limited by the part. One pass of the tool is the desired optimum, but seldom possible with any but soft materials. For a right hand thread each point, from left to right, projects beyond its left neighbor one feed depth per revolution. Left hand threading is done with a tool having each point extension increase from right to left. Sharpening is accomplished by grinding the top of the tool without disturbing the thread form.

Single chasers for use in toolholders can be purchased. National thread form chasers are usually stock items; other forms are made to order. Hand chasers, both inside and outside, having a tang to permit use with a file handle, are also available in National or "V" thread forms.

Dies, Dieheads, and Chasers

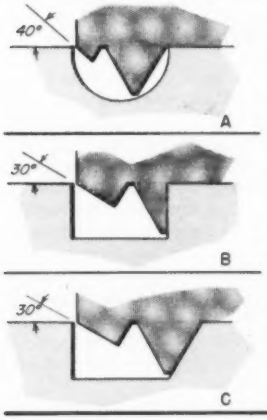
Regardless of its final form, every metalcutting threading tool design is based on the principle of a single-point toolbit threading on a lathe. Solid dies and thread chasers are actually a combination of single-point toolbits, operating side by side; arranged radially or tangentially about the periphery of the part to be threaded.

Most familiar of the dies is the adjustable, round split (or button) die designed for use in hand stocks and screw machines. The button die is actually an adjustable split nut in which flutes have been machined, and hardened, to provide cutting edges. Adjustment of PD is obtained by: (1) three screws in the holder, one to enter the split for expanding and the two on either side for compressing; (2) a setscrew in the die to change its size. For the latter, a single-screw stock is used although the die will fit in a three-screw stock as well. Button dies and the stocks or holders used for them should fit closely and not wobble.

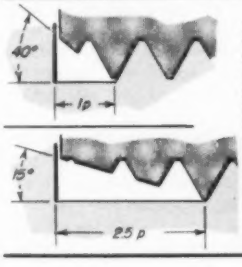
As the die is solid it is non-releasing; it must be backed off the newly cut thread or the workpiece passed completely through it. The die holder, for power threading, may be rotating or non-rotating. In lathe or screw machine, it is usually the latter, and the workpiece is reversed to unwind. However, holders are used in drillpresses or with threading attachments that rotate and reverse the die. The workpiece is either held stationary or threading speed is a differential between workpiece rpm and die rpm.

Leadscrew control will always help a button die to work better; provide a cleaner, more accurate thread. It is practically essential for very fine threads, very small diameters, and for hard or tough materials. Float should always be provided when threading the first piece ,to allow the die to find its own center; then the die is clamped firmly. When threading coarser threads, using leadscrew, a litttle float should be left in holder. This will compensate for small differences between leadscrew, work surface, and die lead. Friction holders are available which permit die to ride with work if it jams, thus reducing chance of breakage.

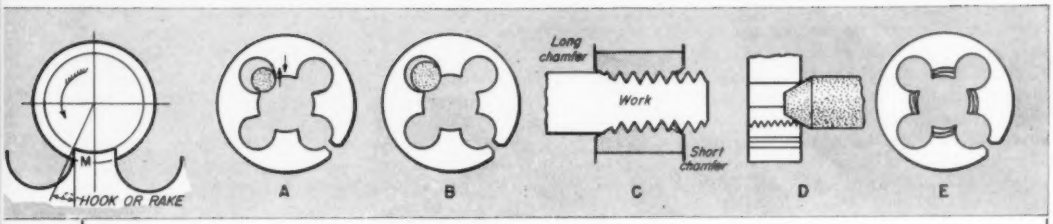
Chamfers are always important, regardless of the thread tool in question. Chasers, solid dies, and taps depend on their chamfers for cutting action. Long chamfers mean better chaser performance, longer life, and permit higher cutting speeds. The reduced tool load allows harder tools to be used. Costs, when threading against a shoulder, are in direct relationship to chamfer length, or clearance provided. Designers of threaded parts should always keep in mind the advantage to the shop of maximum clearance at shoulders or in blind hole-bottoms. 30° rather than 40 or 45° chamfers should be encouraged.



Both form and width of a recess affect chaser performance. Here, form is altered to favor the tool. All three recesses are of equal width, but where a 40° chamfer is necessary for A, a 30° chamfer will thread into B. Still more desirable is C, as a slightly longer chamfer can be used, plus the advantage that the 30° side of the neck eliminates the sharp partial thread left in recess B



Recess width should be as wide as possible; at least 2½-3p (2½-3 threads) where practical. Using the preferred "C" recess, the effect of changing from 1p to 2.5 p triples the number of cutting teeth so the 15° chamfered chaser will remove 3 times as many chips only one-third as thick. Lighter cuts improve thread quality and tool life



SHARPENING A BUTTON DIE

Die-thread cutting edges lie in the side surface *M*, shown above in the end view of a single jaw or cutting arm of a die in contact with work, and can be sharpened by grinding this surface. The ground surface is not radial with the work, but makes a hook or rake angle with the radial line. As in other tools, this rake angle gives freer cutting and pulls the chips away from the work. Cutting surface *M* is ground with a small pencil wheel. The button die is held by hand and moved axially back and forth along the pencil. It can be moved toward and away from the wheel axis to give an approximately flat surface, *A*, or it can be held in one position and ground to the radius of the pencil wheel, *B*. Rake angles of 10 to 25° are used, the larger values for steel, the smaller for brass.

Generally speaking, the rule is:

1. Too little hook will cause the die to drag and tear the thread, or tend to load with chips.
2. Too much hook will cause the thread cutting tips to break off or round over quickly.

Grind approximately the same amount from each surface. If arms are ground unevenly, one will do more cutting than the others; will wear out, break, or produce a rough, uneven thread.

Chamfering of dies (*C* above) is done to spread the cutting burden over several teeth. Most button dies are chamfered at both ends. On one end the chamfer is short and abrupt, to facilitate threading close to a shoulder. The other has a long chamfer, usually two threads, and should be used on all jobs where two incomplete threads can be tolerated. In general, better cutting and longer life are promised when long-chamfer dies are used. This applies to every kind of chaser as well.

Button dies are usually sharpened by grinding cutting faces *M* only. However, grinding the chamfered surface will sharpen the die; is necessary for excessively dull or chipped dies.

To regrind the chamfer, a pencil wheel is used (*D*) of a diameter close to that of the thread. The die is held in the hand (or an indexing grinding fixture, for accuracy) and pressed against the wheel. To provide clearance for the cutting edges, the chamfer is ground deeper at the heel end of the jaw thread than it is on the cutting end. Shaded area in sketch, *E*, shows proper chamfer, but is exaggerated. To get balanced cutting from a die, it is imperative that equal amounts of metal be removed from each jaw when chamfering. Uneven grinding causes one jaw to do all the cutting. This condition strains the die, makes starting the die difficult, and produces poor or rough threads. Watch the chips when die is first threaded on to the work. Equal chips mean even chamfers.

"Acorn" or "Duocone" Dies

The solid adjustable spring die consists of a solid nut in which grooves have been machined to produce fingers (usually four) so pitch-diameter adjustments can be obtained by a collar that fits over, and draws in, the fingers. Of course, the fingers are hardened after machining. "Acorn" is the more familiar shop term, a "trade-name" of Greenfield Tap and Die. "Duocone" is a comparatively recent development of Pratt & Whitney, different in design but similar in principle.

Operating very much as do the "button" dies, these dies are not intended for hand use, but are used in a holder for threading on lathes, screw machines, drill-presses, and power-threading attachments.

Holders for these dies are of two types: reversing and releasing. There is also, for the Acorn die, an adapter for use in round or spring die holders. The "reversing" regular holder has longitudinal float which allows the die to follow its own lead independent of any lag in the machine. The holder is used on practically all automatic screw machines and other machines which provide for automatic reversing of the die or rod at the instant when the desired length of thread has been cut. The "releasing" holder is designed for use on hand screw machines and other machines where work or tool reverse depends upon the operator. After threading a predetermined length, the head of the die releases and turns with the work. When the turret is backed, the die automatically drops back into the locked position and screws itself off.

One advantage of this die over the "button" die

is that when the adjusting cap is screwed up, its taper forces all of the threaded lands "in" an equal amount, called concentric alignment. When the "button" die is adjusted the lands may be thrown slightly off-center by the unequal squeeze at the split. Another advantage is the increased space between the lands or jaws to get coolant in and chips out.

TO MAINTAIN TOP-RAKE ANGLE . . .

WHEN SHARPENING ACORN STYLE DIES FOR SOFT STEEL— HOLD DISTANCE "A" AHEAD OF CENTER

FRACTIONAL				MACH SCREW		PIPE	
Size, In.	"A"	Size, In.	"A"	Size	"A"	Size, In.	"A"
1/16	0.002	1/2	0.023	No. 0	0.002	1/8	0.018
5/64	0.002	9/16	0.027	No. 1	0.002	1/4	0.025
3/32	0.002	5/8	0.031	No. 2	0.002	3/8	0.033
7/64	0.003	11/16	0.035	No. 3	0.002	1/2	0.050
1/8	0.005	3/4	0.040	No. 4	0.003	3/4	0.060
9/64	0.006	13/16	0.045	No. 5	0.004	1	0.076
5/32	0.007	7/8	0.050	No. 6	0.005	—	—
5/16	0.008	15/16	0.053	No. 7	0.006	—	—
3/32	0.010	1	0.058	No. 8	0.007	—	—
1/4	0.010	1 1/16	0.066	No. 9	0.008	—	—
5/16	0.013	1 1/4	0.074	No. 10	0.008	—	—
3/8	0.016	1 3/8	0.082	No. 12	0.010	—	—
7/16	0.019	1 1/2	0.090	No. 14	0.010	—	—

Grinding cutting faces is necessary, occasionally, during the life of the die. When grinding the cutting faces on "Acorn" or "Duocone" dies, refer to this table and sketch to insure maintenance of the proper top rake angle for threading soft steels. For brass, grind cutting faces radial, or zero distance "A", ahead of center. A thin resinoid or rubber wheel is used for this operation

Sharpening "Acorn" and "Duocone" Dies

The jaws do all of their cutting on the chamfered threads at their front end. Usually the die is sharpened by regrinding the chamfers. Equal grinding of the lands is important if the lands are to share the cut equally and a good thread is desired. If possible, a grinding fixture or special machine should be used for sharpening these dies.

Grinding Chamfer—Chamfers should be sharpened on high-speed grinder, with a cone-pointed pencil wheel which has a point diameter smaller than the minor diameter of the die. Each land is chamfered in turn, care being taken to keep cutting-edge angle and chamfer length equal on all lands. Correct relief is indicated when the crest of each chamfered tooth gradually increases in width from the cutting edge toward the heel of the land. The grinding wheel must not be permitted to touch the cutting edge of the next land and dull it.

A solid rest for the hands, close under the grinding wheel, is an aid in holding the die steady while grinding.

Hook angles for threading . . .

Maximum hook angle:

Stainless Steel	— 6°
Aluminum	—20°
Copper	—30°

Hook limit by size of thread:

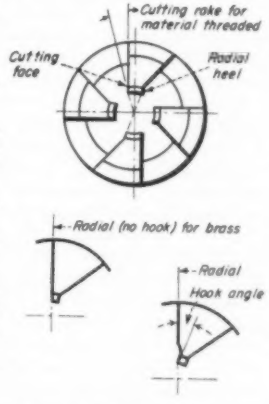
5° for 3/16 in. or #10 machine screw and smaller

10° for larger than #10 and including 3/8 in.

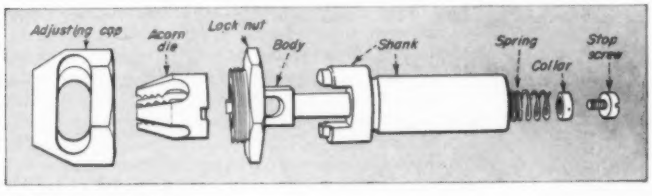
15° for larger than 3/8 in. and including 3/4 in.

20°-30° for larger than 3/4 in.

Radial heel shown is "Acorn" feature patented by Greenfield Tool & Die, which, it is claimed, cleans chips from thread; prevents scoring on reversal

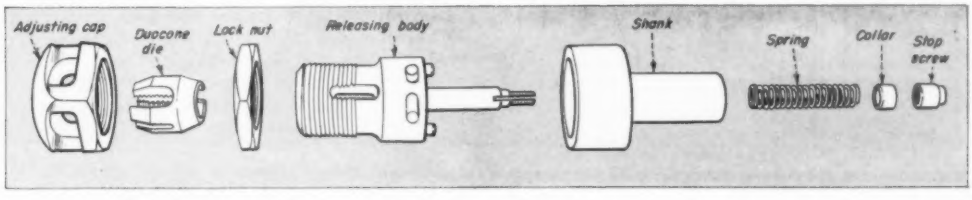


Regular, or reversing, holder...



Reversing and releasing holders are manufactured for both "Acorn" and "Duocone" dies. However, the dies are not interchangeable, as one is designed with a flat seat while the other has a taper seat. Therefore, the make of die must be considered when ordering holders, and the holder style considered when ordering dies. Each manufacturer's die will fit in either of the holder styles he manufactures

Releasing holder...



Diehead Development

Radial design was used for the first diehead, which was non-opening. This principle was also applied to the first self-opening diehead. Following this came a number of diehead styles, all following radial design, then two new principles: tangential and circular chasing dies.

These three, radial, tangential, and circular, comprise all of the chaser styles in regular use for modern diehead threading. Every diehead design is built on an improved action for one of these three. Segmental chasers are considered with radial chasers because they are actually radial chasers designed for economy, particularly for fine-pitch threading.

Dieheads are designed for a wide variety of applications and threading problems. They are selected on the basis of the job to be done and the machine available. All self-opening dieheads must: (1) position the particular chaser properly for correct cutting action, and (2) open automatically out of the thread, thus permitting the die to be retracted rapidly from the work. When ordering a diehead, it is extremely helpful if a sketch and description of the job are forwarded with the order.

Despite the wide variety of diehead classifications, there are only two general styles, (1) the stationary, or hand-operated, group and (2) the revolving or rotating group.

The hand or stationary diehead has a handle to open or retract the chasers. It is never used where a die is required to revolve around its own axis. Chasers are locked by the handle either manually, as on the turret lathe, or by a finger or cam, as on automatics such as the Brown & Sharpe or Cleveland. This style of diehead "pulls off" (opens up) at the end of the cut without help from an external mechanism, as is necessary with a revolving head.

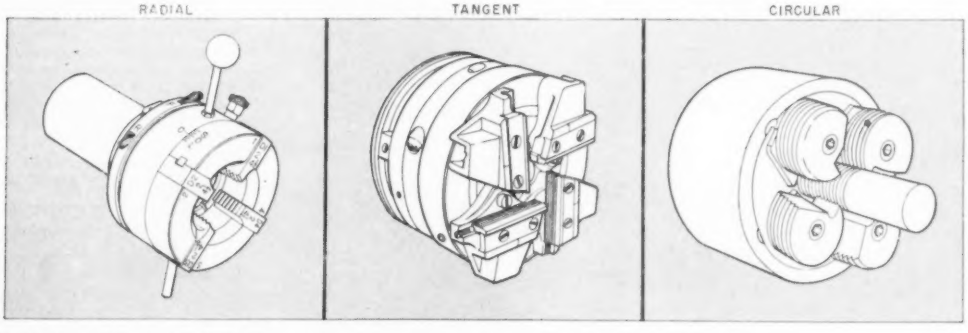
Revolving dieheads are just what the name suggests; are used on machines where the die spindle rotates, as on automatic screw machines, drillpresses, and special threading machines. Actuation for opening and closing these dies is by a fork or yoke that fits into a groove around the outside of the head. This device is controlled by operating mechanisms which are an integral part of the various machines.

Sometimes a revolving die is used as a stationary die. This is seldom practical; usually an exceptional

Diehead genesis started with the combing tool, which led to the solid adjustable spring die and the button die. These provided adjustability for diameter, but caused the thread shape to vary, hence distort the resulting thread . . .

Inserted blades entered the picture as an improvement on the solid adjustable spring die. Actually radial chasers, they were fastened into a solid block, hence it was no longer necessary to throw away the entire die when teeth were worn beyond resharpening. However, thread uniformity was still poor . . .

Then came the adjustable die-head non-opening which utilized radial chasers. This was a major improvement over the spring die as it had the advantage of support and of linear diameter adjustment. Chasers could be reground 3 or 4 times before they were discarded. Here was the beginning of modern diehead development



Radial, tangent, and circular chaser dieheads comprise all of the method of diehead threading

measure, done for convenience or special machine setup; means wasting a more expensive tool.

Generally speaking, the rule for the number of chasers required in a diehead is: 4 chasers for diameters up to and including 4 in., then 1 chaser for each additional inch diameter. For 10-in. dia, 10-12 chasers are used. In the larger sizes, particularly, a few additional chasers will considerably increase the tool life of all.

Dieheads must be selected in relation to size of thread to be chased. Heavy heads will cause difficulty if used for very fine (50-100 pitch) threads, especially when self-leading. First, the head will bear down on the top of the workpiece and second the fine threads will not be able to pull the diehead along. This is remedied by: (1) selecting a different threading method, (2) using a lightweight die head, or 3) using the same diehead, with special support and a leadscrew.

Selection of diehead size and style depends upon whether the diehead revolves or is stationary and the manner in which it is opened or closed. Therefore, diehead style is usually determined by the type of machine on which it will be used.

Diehead size is selected by: (1) size or clearances on machine, the head is to be used on, (2) size of threads to be cut. If the diehead is purchased for cutting relatively fine pitches on relatively short threads, then a smaller head is more suitable because it is lighter in weight and adjusts itself more readily to slight misalignment.

Coarse threads, tough material, and long threads call for a larger-capacity diehead, if it will clear the machine. Standard-make dieheads are not standard as to size. Size varies with style and purpose for each manufacturer. For example, circular chaser dieheads usually have a larger over-all diameter than radial or tangent chaser unit.

Chasers

Each style of chaser has certain inherent characteristics, the value of which, like the diehead, is determined by the job to be accomplished.

Radial chasers are most suitable when large-diameter thread capacity is needed within a certain fixed OD of head. Also, many large-diameter, coarse-pitch threads having a steep helix must be cut with radial chasers rather than the "long-life" tangent or circular chaser.

Among the advtantages of the radial for this operation are: Chasers can be supported more rigidly, can be wider to allow a longer chamfer and still have a number of full guiding teeth, more chasers can be placed in a fixed OD of head, and the head is adaptable to rough and finish cuts. Also, the radial chaser requires a minimum of machine swing for the maximum size of thread.

Right- or left-hand chasers can be used in the same radial head without any changes or adapters.

Radial chasers, however, are short lived. They are also inherently difficult to resharpen, requiring more time, knowledge, and experience than any other kind. The difficulty increases with the number of resharpenings. Breakage, too, is a problem in that a break in one chaser is likely to ruin the whole set. Close-to-shoulder threading greatly increases breakage costs for any type of chaser, consumes more time in resharpening, and, in the case of the radial, necessitates repositioning of the die for correct thread length each time the chaser is resharpened in the chamfer.

Radial chasers are provided in two forms: milled or ground thread, and tapped or hobbed thread.

Prior to actual setup, the following five fundamentals should be followed:

1. Insert chasers
2. Adjust chasers to size
3. Set stop for length of thread
4. Determine the proper speed
5. Select the proper lubricant

Radial Chasers and Thread Troubles

Most threading troubles are caused by improper sharpening of chasers. *Never grind chasers freehand.* Always use a grinding fixture or grind them on a surface grinder equipped with a suitable workholder. Another frequent cause is work and threading spindles out of alignment. *Check regularly!*

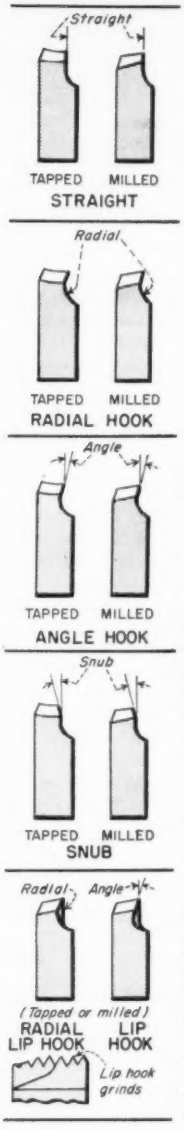
Rough threads are caused primarily by incorrect face grinds, improper chamfers, incorrect bearings, and dull chasers. Another frequent cause of rough threads is improper lubricant. This, alone, may make all the difference between rough threads and smooth, shiny threads.

Poor thread form may be caused by a number of conditions, the remedy for which is self-evident when the reasons are known. They are:

1. Misalignment
2. Worn tools

Bearing is shown as the shaded portion of the chaser. When chasers have too heavy a bearing they rub too hard; they may produce poor threads and even cause breakage. Bearing is controlled by chamfer clearance angle. Increasing angle decreases bearing and vice-versa. Milled form chasers and sometimes tapped form chasers and tap chasers may be corrected for heavy bearing by grinding back the cutting face by 0.002-0.003-in. increments, testing the chasers after each grind. It is also possible to calculate the proper chamfer clearance angle for the job, then grind for the correct bearing

Radial Chaser Grinds and Lubricants . . .



Material	Grind No.	Lub
ALUMINUM		
Cast & Die Cast	1	D
Rod	1	D
Stamping	1	D
BAKELITE	4	B
BRASS		
Bar	3	G
Cast	4	B
Forging & Stamping	2	G
Tubing	2	G
Naval	2	G
BRONZE		
Bar	2	G
Cast	5	B
Cast Aluminum	2	G
Manganese	2	G
Naval	2	G
Phosphor	2	G
Tubing	2	G
CELLULOID	5	B
COPPER	6	G
EVERDUR	2	A
FIBRE	4	B
IRON		
Cast	5	C
Malleable	2	A
Wrought	2	A
MAGNESIUM	1	D
MONEL METAL	2	F
NICKEL	7	F
RUBBER	4	B
SILVER—GERMAN	2	G
STEEL		
Bessemer Scr. Stock	2	F
Cast	2	A
Carb. SAE 1010-1035	2	F
Carb. SAE 1112-X1340	2	F
Carb. SAE 1040-1095	7	F
Mang. SAE T1330-T1350	7	H
Chrome SAE 5120-52100	7	H
Chrome Van. SAE6115-6195	7	H
Forging	7	E
Molybdenum SAE4130-4820	7	H
Nickel SAE 2015-2515	7	H
Ni-Chrome SAE 3115-3450	7	H
Nitralloy	7	H
Stainless	7	H
Stamping	8	F
Tool	7	F
Tubing	8	H
Semi-Casting	5	A
ZINC Die Casting	1	A

3. Worn chaser keys (in certain heads only)
4. Inexperienced operators—an operator may force the turret faster than the lead of the thread or allow the turret to drag
5. Improper camming on automatic machines
6. Wrong grind on chasers
7. Insufficient bearing
8. Shaving resulting in imperfect threads is often called poor thread form

Shaving means that not all the chasers in a set are tracking properly or following exactly in the groove cut by the preceding chaser. Each chaser may cut a perfect thread form, by itself, but the combination of chasers produces a thin or incorrect form.

Correction is accomplished in the same way as for poor thread form. If light bearing is the trouble, lap opposite chasers together, using fine emery and oil. Take eight strokes, then test for results. Too much lapping has a tendency to ruin thread form and cause additional troubles.

Milled chasers may be, and tapped chasers usually are, lapped right in the diehead, using a sample part. Only the chasers that are shaving are to be lapped.

Tapered threads show a variation in diameter at the pitch line and usually result from chaser shaving, insufficient bearing, excessive bearing, misalignment, and badly worn tools.

Stripped or torn threads are very similar to those outlined under "rough threads", and are caused by incorrect face grinds, improper chamfers, misalignment, badly worn tools, chasers too keen, improper speeds, and improper lubricant.

Chattered threads, out-of-round, or drunken threads result from insufficient bearing, improper chamfer, and improper face grinds.

Only cutting face grinding is described. All specifications are approximate; may have to be varied to obtain best results. Lip hook grinds are to include first full tooth beyond the chamfer, except for shoulder work, in which case, use the same angle but omit the lip. Use this chart for all right-hand chasers and for all left-hand chasers when threads are National Coarse and finer. For all other left-hand chasers follow original grind on chaser or request instructions from manufacturer. Taper diehead chasers are ground same as straight thread chasers. Tapped form diehead chasers can be sharpened on chamfer or cutting face, but milled form diehead chasers should be sharpened on chamfer only. When it is necessary to touch up cutting face, do so very lightly

CUTTING FACE GRINDS FOR DIEHEAD CHASERS, MATERIALS ABOVE

GRIND No.	MILLED		TAPPED		LUBRICANT (Lub.)	
	Straight Thread	Taper Thread	Straight Thread	Taper Thread	SYMBOL	KIND
1	15° Rad. Hook	10° Rad. Hook	15° Rad. Hook	10° Rad. Hook	A	Soluble Oil
2	10° Hook	5° Hook	10° Hook	5° Hook	B	Dry†
3	5° Hook	Straight	5° Hook	Straight	C	Dry or Soluble Oil
4	5° Snub	5° Snub	5° Snub	5° Snub	D	Kerosene Oil
5	Straight	Straight	Straight	Straight	E	Lard Oil and White Lead
6	15° Rad. Lip Hook	10° Rad. Hook	15° Rad. Lip Hook	10° Rad. Hook	F	Mineral Lard (20% Lard)
7	15° Hook	10° Hook	15° Hook	10° Hook	G	Paraffin Oil
8	10° Hook	5° Hook	10° Hook	5° Hook	H	Min. Lard or Sulphur Base*

*Min. (Mineral) Lard Oil should contain about 20% Lard Oil. †Usually run Dry but coolant is recommended.

Threading Speeds for HSS Chasers...

Material	Speed Symbol
ALUMINUM	
Rod	
Cast	
Die Cast	F
Stamping	
BAKELITE	
BRASS	
Forging	D
Stamping	E
Tubing	
Cast	F
Bar	
BRONZE	
Naval	D
Phosphor	
Tubing	
Cast	E
Bar	
Mang'nese	
Cast Alum.	
CELLULOID	F
COPPER	E
EVERDUR	C
FIBRE	F
GERMAN SILVER	E
IRON	
Wrought	B
Malleable	C
Cast	D
MAGNESIUM	F
MONEL METAL	A
NICKEL	D
RUBBER	F
STEEL	
Bessemer	
Scr. Stock	
Cast	C
Carb.1010–35	
1112–X1340	
Carb.1040–95	
Mang.	B
T1330-50	
Chrome	
5120–52100	
Chrome Van.	
6115–6195	A
Forging	
Molybdenum	
4130–4820	
STEEL	
Nickel	
2015–2515	
Ni-Chrome	
3115–3450	
Nitralloy	A
Stainless	
Free Mach.	
Stainless	
(Stringy)	
Stamping	B
Tool	A
Tubing	B
Semi-Casting	D
ZINC, DIE CAST	F

Speed Symbol	sfpm/tpi			
	3 to 7½	8 to 15	16 to 24	25 & up
A	8	10	15	20
B	15	20	25	30
C	20	30	40	50
D	25	40	50	80
E	40	80	100	150
F	50	100	150	200

Speed symbol is given opposite material. Reference to symbol on accompanying chart will provide the proper sfpm for a given tpi. Taper threads produced by jam cut should be threaded at 75% of speed given

Lead error may be detected with a gage or by using one chaser as a sample thread. Lead errors are usually caused by: (1) chasers shaving, (2) incorrect face grinds, (3) improper chamfers, (4) inexperienced operator, (5) incorrect camming, (6) wrong speeds, (7) misalignment.

Chasers can be corrected for lead by lapping. The method is the same as described for correcting light bearing with one very important difference. The chasers are reversed in respect to each other when rubbing; chamfer-end, or bottom, of one to top of opposite.

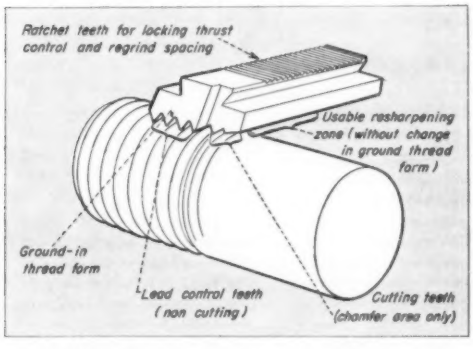
Difficulty in maintaining proper pd results from chasers shaving, incorrect face grinds, tapered threads, and worn tools. Analysis of the tools and chased threads will usually determine which trouble is the cause; hence suggest the needed correction.

Specific threading problems that resist solution should be discussed with the chaser manufacturer. All manufacturers have large staffs of competent engineers whose specialty is screw-thread cutting. However, a full description of the job to be threaded should accompany every chaser order—or problem.

Tangent Chasers

Two kinds of chasers are available for tangent cutting. One has the thread helix in the chaser and is mounted straight in the die head. The other has a straight thread on the chaser, hence must be mounted in the die head at the proper helix angle.

It is possible to replace individual chasers with the tangent chaser without helix, and they can be used for cutting left or right-hand thread. Tangent chasers with helix must be reground and replaced as a set. For lefthand threads, lefthand chasers and holders are required. However, the chaser without helix is more difficult to set for cutting bearing and spacing.


Ratchet teeth for locking thrust control and regrind spacing
Usable resharpening zone (without change in ground thread form)
Ground-in thread form
Lead control teeth (non cutting)
Cutting teeth (chamfer area only)

Tangent threading is just what the name implies. The chaser is tangent to the workpiece rather than radial. All of the cutting action takes place at the chamfer, the remaining teeth control lead only

Tangent chasers are longer-lived than radial chasers, but they are not as well suited for the coarser of coarse threads. Nevertheless, many of the radial segment or insert, the tangent, and the circular chasers will outproduce the solid radial chaser on the basis of pieces per chaser dollar. Both tangent and circular types are particularly advantageous for close-to-shoulder threading and have the added quality of being variable as to rake and cutting bearing.

It is essential to troublefree, efficient working of a die using tangent chasers with helix that some positive method of checking grinding and setting of the chasers be provided. Without this the chasers are subject to the same problems of bearing and spacing as chasers without helix.

Tangent chasers are considerably easier to grind than radial chasers, in that there are no complications of chaser teeth or chamfer clearance angles.

These are taken care of by the design of the head, the chaser holder, and by the very nature of the tangent chaser which is always tangent to the stock. The bearing problem is also simplified as the bearings of the guiding teeth and cutting chamfer are independent of each other.

Threading Close to a Shoulder

Regardless of the threading method contemplated, designs which require threading close to a shoulder should be avoided unless absolutely necessary. Designing short necks, without regard to the need for them or for the pitch of the thread, and the common practice of showing threads clear up to the shoulder, makes short chamfers necessary.

A short chamfer increases the likelihood of chaser breakage, shortens chaser life, adversely affects thread quality, and necessitates operation at slower spindle speeds. This increase in tool cost and decrease in production has greatly increased the cost of threading for many concerns otherwise alert to the economies of manufacturing. There is no excuse for adding this cost burden simply because someone is following standard drawing practice.

Circular Chasers

Like the tangent chaser, circular chasers are made with or without helix. The circular chaser, too, is a long-life chaser, in fact the longest lived of all. It has 20-50 times the life of the flat tangent chaser. The circular chaser with helix has the helix and spacing in the chaser independent of the holder. For this reason, the chaser requires only one set of holders, regardless of pitch, form, or diameter, for either right- or left-hand range, within the stated head capacity.

Positive means must be provided for setting the chaser and measuring the bearing relative to center as well as relative to spacing. Without this varied bearing, uneven cutting, and off-spacing would result. All chasers in a set must be ground the same. Left-hand chasers are required for left-hand threads.

The circular chaser without helix takes its helix from the chaser holder and the chaser spacing. Theoretically, for accurate threading, a separate set of holders for each size of thread is required. It is also possible with these, and tangent chasers without helix, to provide split helix holders. However, this creates a liability of off-lead for all but the one exact lead. This off-lead is so slight that, for average threading and particularly short threads, it will not make the thread unusable. Left-hand holders are required for left-hand threads.

Positive means of setting the chasers and measuring the bearing should be provided. It is not, however, possible to measure exactly the cutting bearing on a circular chaser as the cutting edge is the junction of two angles. Circular chasers without lead can be used for cutting right- or left-hand threads. This style of chaser, similarly to the others, should never be ground free-hand. Cutting action is always better if a fixture is used and chaser is set to the proper gage, usually available from manufacturers.

Trouble-shooting

Eccentric threads—PD is not concentric with OD of work, or one side of part shows a flat and opposite side shows stock removed by chaser root: Usually a result of improper alignment between threading tool and work. Trouble can be partially corrected by increasing the face angle on the chasers, and bevelling the piece so all chasers start cutting at one time.

Out of round or wavy threads—Chasers may cut perfect pitch diameter and smooth threads from first thread to last, but threads will not fit "go" gages; if laid on straight edge, rest of thread will not follow a straight line: Correct by having the chaser grind more above center. Also check machine bearings for camming.

Rough threads may be a result of excessive surface speed, insufficient or poor coolant (flow of cutting oil should be volume, not pressure), chaser chamfer or lead may be too short when longer lead is permitted, or hook angle may be insufficient or ground too shallow for chip clearance: In most cases this condition is corrected by grinding chaser face.

Shaved threads are very often caused by a turret which is too heavy, a diehead too heavy for the pitch being cut, or a binding threading spindle which does not move freely with the diehead during cutting: Be certain turret, diehead, or spindle "follows" the die or thread without excessive drag, particularly when cutting finer pitches. Shaved threads may also result from chasers which are ground too far behind center, permitting threads beyond the chamfer or first full thread to cut. This usually causes threading behind on lead and shows a taper. Check the lead, increase the face angle, and grind chasers more over center.

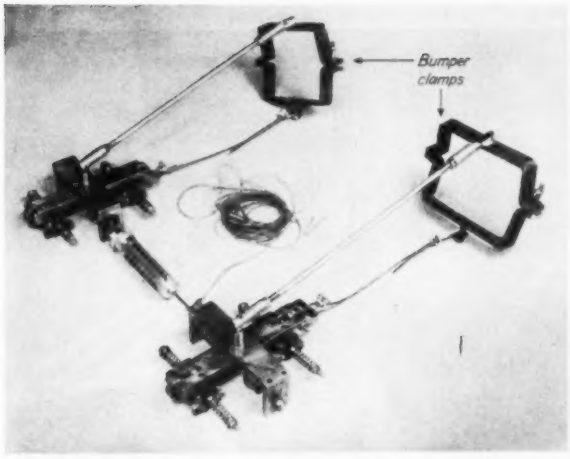
Shave or taper on first thread is usually a result of poor alignment; or, if on brass, cast iron, malleable iron, or aluminum, increase surface speed.

If chasers do not collapse freely from work when diehead trips: Increase face angle and grind more over center. If this does not correct condition, check diehead for operation without workpiece.

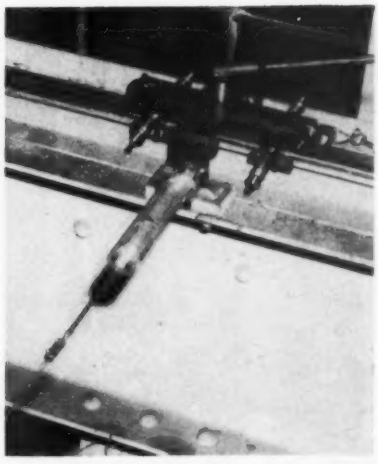
ACKNOWLEDGMENT

We wish to express our sincere appreciation to the following companies for their generous contributions of time and text to the preparation of this report:

Aluminum Company of America
Bay State Tap & Die Co.
Bridgeport Brass Company
Brown & Sharpe Mfg. Co.
Cleveland Automatic Machine Co.
Cone Automatic Machine Co., Inc.
Eastern Machine Screw Corp.
Geometric Tool Company Division, GTD
George Scherr Company, Inc.
Gisholt Machine Co.
Greenfield Tap & Die Corp.
Greenlee Bros. & Company
Hardinge Brothers, Inc.
Jones & Lamson Machine Co.
Landis Machine Co
The Lees-Bradner Co.
Modern Tool Works
The Monarch Machine Tool Co.
The National Acme Co.
The New Britain Machine Co.
Pratt & Whitney, Small Tools Div.
Rivett Lathe & Grinder, Inc.
The Sheffield Corp., Murchey Div.
Snow Manufacturing Co.
South Bend Lathe Works
Threadwell Tap & Die Co.
The Warner & Swasey Co.



Alignment checker consists of trolleys that fit on each crane rail and spring scale connected to wire stretched between them. Brackets clamp to crane bumper



In action, trolleys are pushed along rail by crane. Pointer on scale indicates amount of spread between the two rails

NEW METHOD SPEEDS CHECKING OF CRANE RAILS

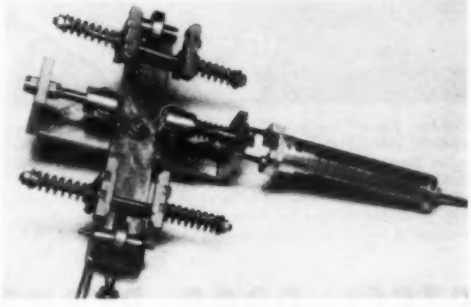
Tool with indicator permits alignment to be checked faster, more accurately, and with greater safety

BY ALFRED ZANOTTA
Supervisor of Crane Maintenance
WATERVLIET ARSENAL, Watervliet, N. Y.

IN MANY industrial plants, far too little consideration is given to an efficient and safe procedure for checking the alignment of overhead crane rails. Procedures often are hazardous, time-consuming, and in the long run entirely inadequate for the job.

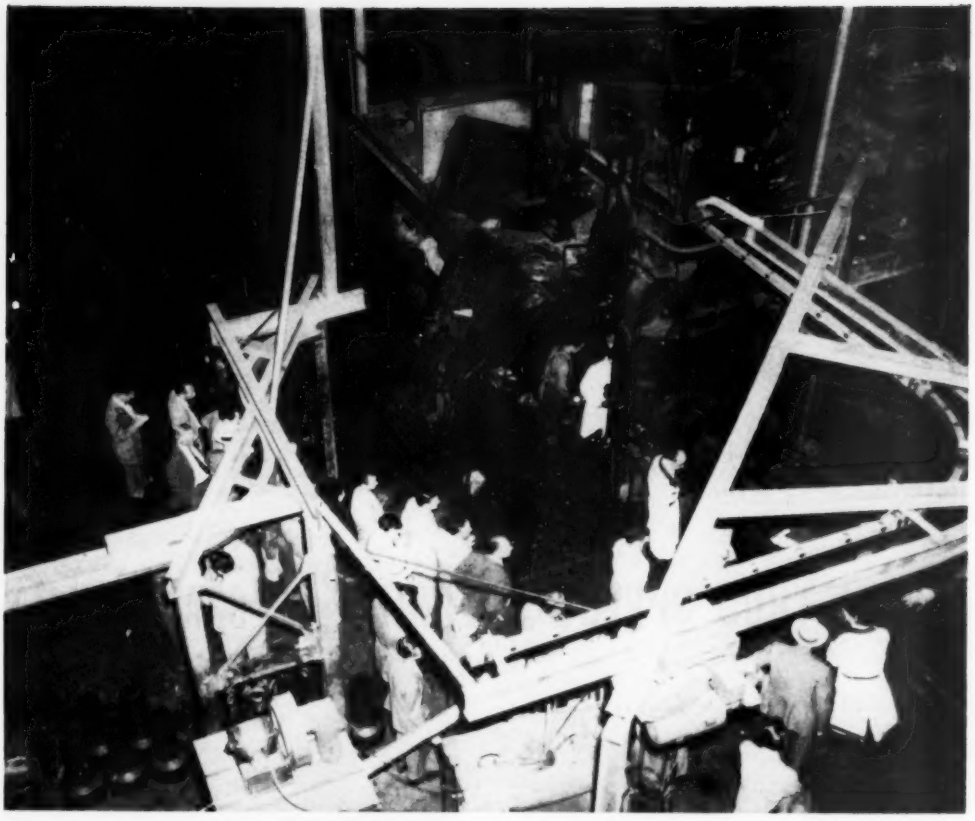
For example, spread usually is checked by two men who walk down opposite rail runways with a tape or tram stick between them. In some cases, these men must spend three or four hours on the crane runways. In addition to the danger involved, the check usually is inaccurate because of the human tendency to error—a tendency aggravated by the poor conditions under which the men must work.

To remedy this situation, a device has been developed at the Watervliet Arsenal that gives direct indication of crane-rail spread. When this device is in position on the rails, a spring scale, fastened to one trolley, is connected to the other trolley with a guide wire that can be adjusted to the span of the crane. Adjustment is made so the wire is tight when the scale pointer is on zero. Both trolleys are fastened to the bumper of the crane through a rod and bracket. Setup requires about 20 min. Once the setup is made, the operator simply stands on the crane catwalk and watches the scale pointer as the crane moves down the bay. The new method is safer, more accurate, and requires but a fraction of the time needed for the old method.



Trolley is of light but durable construction and is made to avoid inward tilting during the operation. Spring-loaded shoes hug rail tightly

Correction for spread also can be made with the same device. With the tool in place, rails are loosened, moved until the scale indicates correct alignment, then are clamped in the correct position.



5500-ton Loewy horizontal press at Adrian, Mich., pilot plant of the Air Force is used in 3-step extrusion of propeller blade. Full machine power is required, so mandrel must apparently be designed to produce desired cross-section as it feeds forward with ram. Thus each extrusion step presents a new problem in calculating metal displacement, so a mandrel moving only about 8 in. will produce desired internal shapes for 2 (first two steps) to 8 ft (last step). Similar press at Inco, Huntington, W. Va., was described (*AM*, Feb. 1945, p. 126). Special handling devices speed transfer of billet from salt baths to press. Note billets after second extrusion at lower left and salt bath on gallery at top right

STEEL PROP BLADES EXTRUDED WITH INTERNAL TAPER

Curtiss-Wright and Air Force announce joint development of 3-step extrusion process that slashes production time, eliminates welding, improves product quality. Specially developed: mandrels on ram apparently used to produce complex internal cross-section, including long blade taper

BY E. J. TANGERMAN, EXECUTIVE EDITOR

Spectacular savings in materials, skilled manpower, machining, tools and manufacturing floorspace are made by development of a new mass-production method of extruding 1-piece hollow-steel propeller blades for high-speed combat and commercial aircraft. Three extrusions, requiring only minutes, replace hundreds of hours of tedious hand work in producing the welded blade, according to engineers of the Propeller Division, Curtiss-Wright Corporation, Caldwell, N. J.

The development was made in cooperation with the US Air Force, and extruding is done in the 5500-ton Loewy horizontal press at the Air Force Development Center, Adrian, Mich. (p148, this issue). It is the outgrowth of a research program undertaken two years ago by the Propeller Laboratory, Engrg Div, C-W; and the Mfg Methods Branch, Industrial Planning Div, Air Materiel Command.

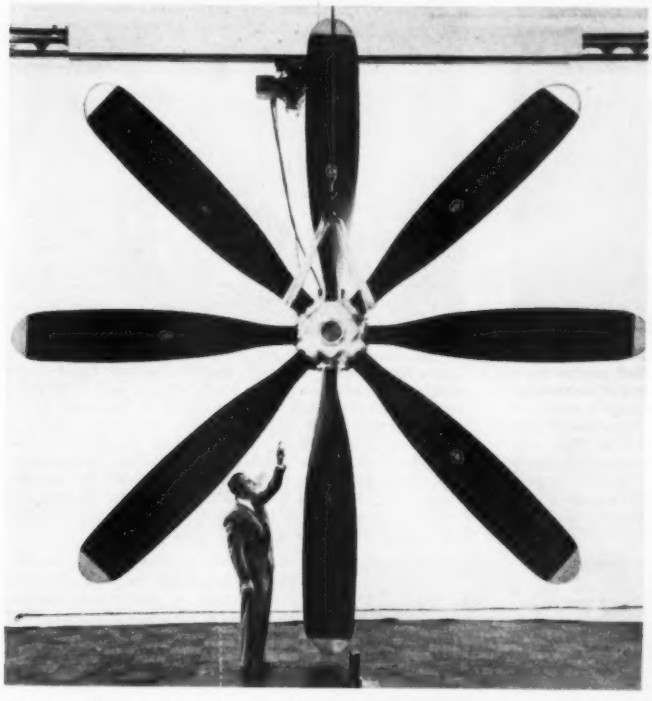
Blade quality and strength-weight ratio are markedly increased because the tough, integral structure of the extruded steel provides greater resistance to more severe fatigue and other stresses in propellers for high-horsepower turboprop engines (up to 20,000 hp. according to recent announcements) at speeds which may eventually reach 1000 mph.

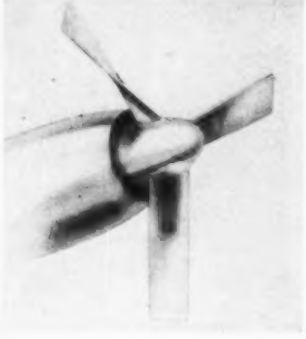
Production of the extruded blade has already begun, so welded types will be supplemented with the new ones as rapidly as facilities become available. Completed blades are the same monocoque design as welded blades pioneered by Curtiss-Wright. Trapezoidal in shape, they are widest at the tip, which is square.

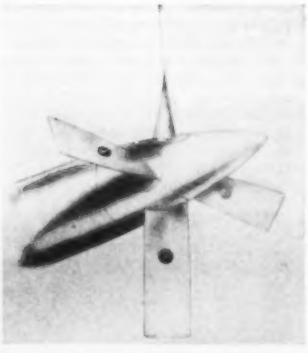
Hot extrusion of steel has heretofore been limited to smaller billets and uniform cross-sections, such as pipe and bar. Here shape is complex, and varying tapers must be produced over varying lengths. This development makes it possible to squeeze a 400-lb chrome-nickel-moly steel billet through a series of dies with a series of mandrels to produce a 10-ft, 200-lb blade tube. This replaces a series of machining, blanking, forming, welding, and brazing operations on two specially processed flat plates, requiring 750 lb of metal. Thus material saving alone is almost 50%.

The extrusion is a tapered-wall, seamless, round tube with ears or ridges from shank to tip. As ears do not extend over the shank, the latter is obviously completed in the first two passes. Ears become the solid leading and trailing edges of the blade when it is finished. Key steps are pictured here.

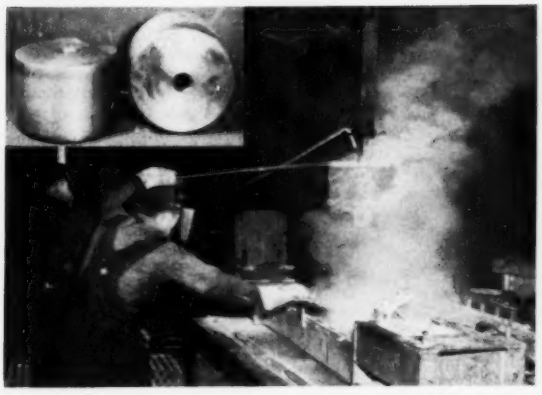
Based on experience gained, engineers feel that the process can be adapted to production of landing-gear struts, helicopter masts and main rotor-blade spars, drive shafts, and such non-aviation products as gun barrels, tank and ship elements, and structural shapes.



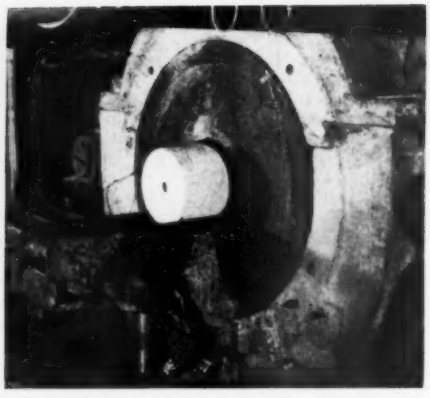




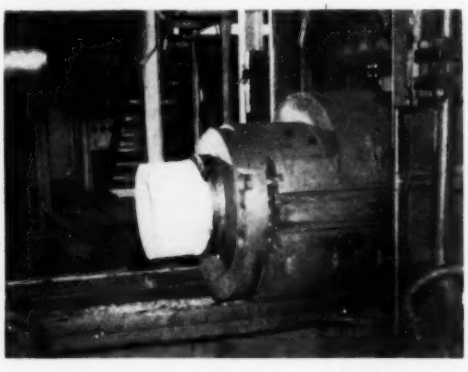
Three propellers of advanced design for turboprop engines. That above is the "Octoprop," biggest of the Turboelectric series announced last Oct. 30. It is 19 ft in diameter, has blades tapered in cross-section, which probably can be extruded with some modification in the process. However, best application at present is in the subsonic model (top right), rectangular, stubby, square-tipped blade of the single-rotation type. Blade sections are thinner, and blade-pitch distribution refined to give greater efficiencies than those of propellers of more familiar shape. At lower right is the "Turbosonic," supersonic propeller of the single-rotation type, designed for speeds up to 1000 mph. It will probably have solid airfoil blades. Designed for use with engines of 2500 to as high as 20,000 hp, this series of propellers will handle new long-range bombardment, troop-carrying and transport aircraft



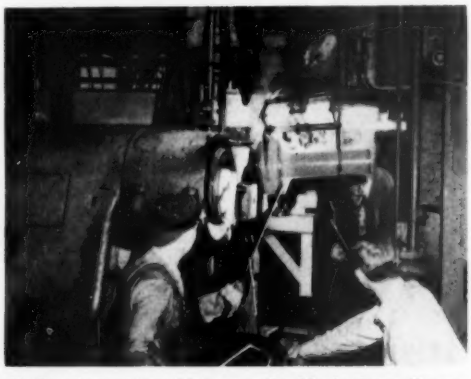
Salt-bath heating of the 400-lb billet precedes extrusion. Presumably, this is done, as suggested in our Extrusion Special Report (*AM*, May 15, '50, p107) to assure even heating, protect from atmosphere without affecting surface characteristics, and to provide a salt surface that aids in lubrication for extrusion. Normal die lubricants are tallow, heavy oil, and graphite



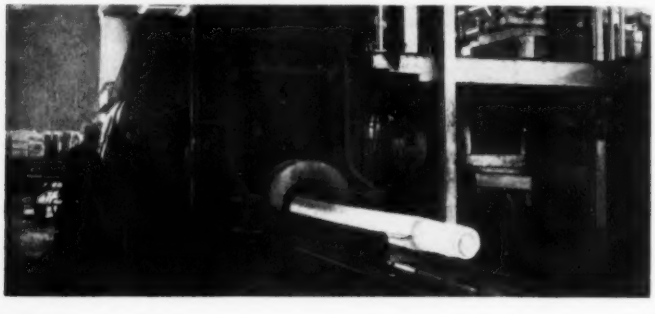
Billets, of chrome-nickel-moly steel, are apparently about 8 in. long, 14 in. in diameter, with a center hole. Here a billet is ready for the first extrusion. Inspection of released photos indicates that mandrel must do some shaping even in first pass, producing blank with long shank, heavy unextruded portion



Two extrusions produce this shape, which shows inside taper and the portion that will be extruded in the third pass into the blade proper. As the finished extrusion shows no fins on the shank, that portion is presumably complete at this time. Shanks were formerly induction-heated and upset to attain a fairly complex cross-section. This now must be attained by movement of the mandrel with the ram to control cross-section and length. Unextruded portion (eventual blade) already shows evidence of taper that is necessary in finished blade. Reverse tapers would be impractical, unless mandrel entered from the exit end

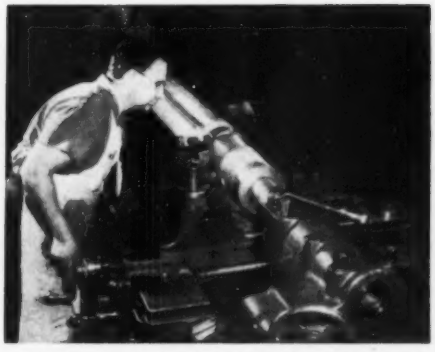


At the start of the third pass, the blank shows the exterior shank form complete, including a slow taper to the portion that will become the blade. Square end of the piece indicates that it has been trimmed, presumably to remove surface metal extruded from the core. This final extrusion will lengthen the piece, now apparently about 30 in. long, to 10 ft or more, with walls of the blade section tapered in thickness from shank to tip and fins or ears formed on the sides which will become the leading and trailing edges. This is thus more complex than familiar extrusions of constant cross-section



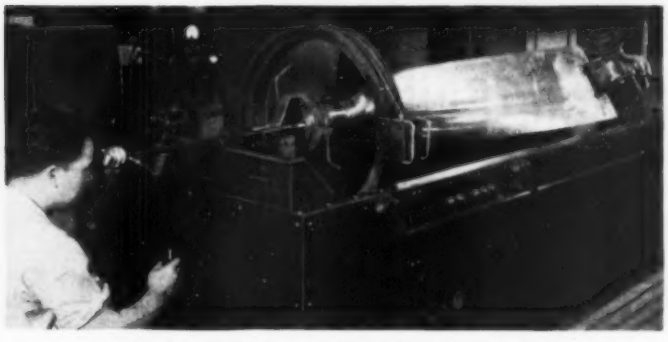
Leaving the press, finished extrusion shows taper in wall thickness—the end nearest the press is already cooler than the shank end, as indicated by the darker color. When trimmed, the blade blank will weigh about 200 lb, or half the weight of the billet—further evidence of trimming during the process to remove surface and excess metal. The 3-step extrusion process probably cuts time to a fourth or a fifth of that required for welding, and provides an open-end blank easy to finish inside. Salt bath at top right

Finished extrusion shows shank taper and ears the full length of the blade portion. Next steps are probably like those on welded blades: press hot against a mandrel to attain flatness, then reheat and inflate with nitrogen against a die (1100 psi) to get desired twist—and curved shape of lower-speed present types. Presumably, before this is done, interior finish must be brought to desired quality by removing mandrel marks, gouges and scale which would cause stress concentrations in service

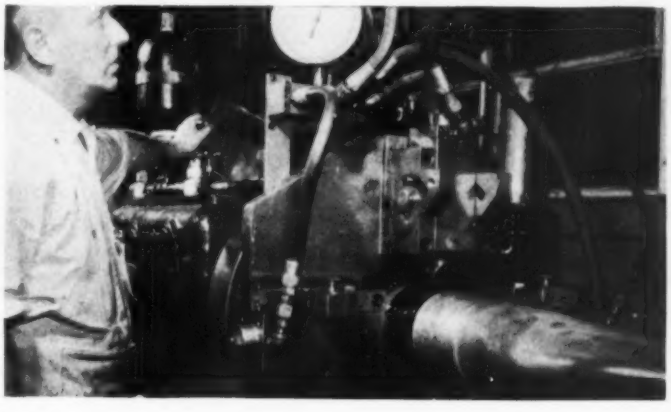


Shanks are rough-machined before blades are formed. This is a conventional turning operation, probably slightly more complex than for present-day propeller blades, in which flange and cuff ring are produced by upsetting. The extruded blade could probably be upset in the shank at the same time as the body is straightened after extrusion, if that becomes desirable

Finish machining is done after the blade is formed. Blade is held in a drum spindle and shank bored, faced, finish-turned and ground, including any internal reverse taper, if design requires it



Internal Magnafluxing checks inner walls for laminations, cracks, scratches, scale or other faults. This process is also used extensively on conventional welded blades. Probably X-ray is also used to check for internal flaws, although no details on this part of the processing have been released. Finishing also must include blade polishing, plating with zinc, interior painting, injection of rubber tips, etc.

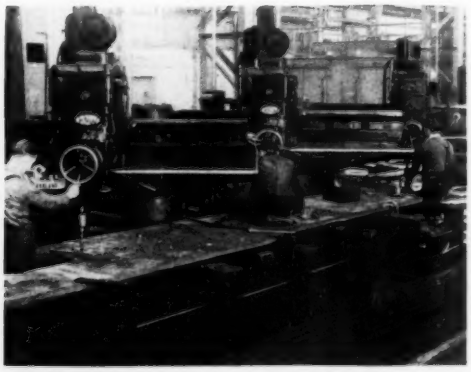


Cold-rolling the shank of the finish-machined blades is a surface-improving device. Whether or not shotpeening is also used on blade surfaces and some portions of the shank has not been announced, nor have details of stress-relieving, if necessary

Battle-tried in Korea, the Centurion weighs a few tons more than the American Patton, has armor of about the same thickness, and is powered by a 12-cyl engine of lower horsepower. No comparative data are available on firepower, mobility, flotation and servicing problems

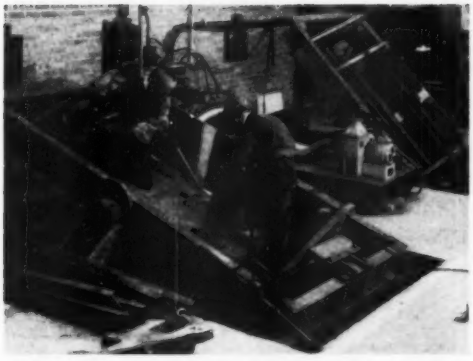
Britain Builds Modern Tank With Standard Machines

As far as is known, the Centurion Mark III 50-ton tank is the only "new model" to be produced in quantity by any nation since 1945. Good use of fixtures on standard machines is evident, plus some equipment unlike that used in American tank plants

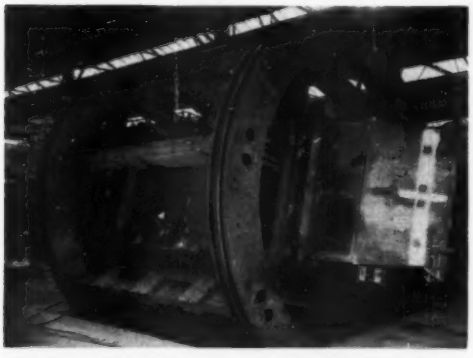


Side plates are armor plate 2 in. thick and measure 22 ft 9 in. long. Over 150 holes are drilled, bored and tapped on a machine consisting of three Kitchen & Wade 8-ft radial drills. Separate jigs are used for hole groups

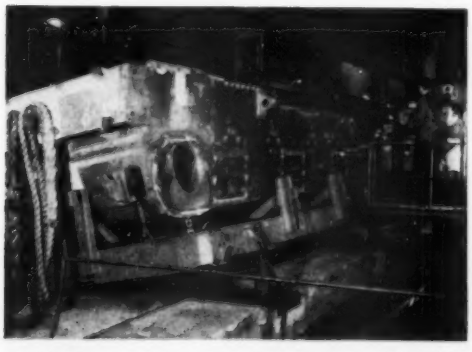
Floor plates are welded in jigs fitted with swing clamps. All welding jigs are in pairs, in order to obtain continuous production. A fitter sets up parts in one jig while an assembly is being welded in the other. Before welding starts, alignment is checked by an inspector



Nose armor 3 in. thick is welded by the downhand method, which calls for the use of manipulator jigs. Austenitic electrodes (3/8 in.) are used to join the nickel-chrome armor steel to plates using 1-in. fillets. Portable fume exhauster stand between the two manipulators

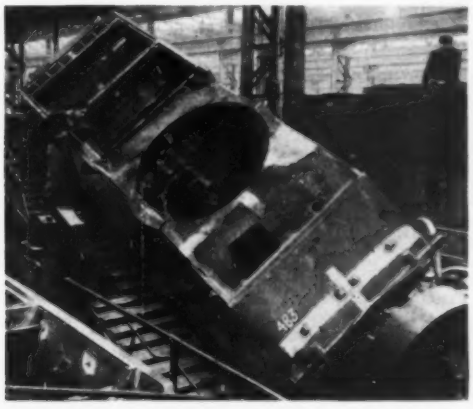


Rotary manipulator for hull welding is 24 ft. in dia. Bogie is pulled along shop tracks and onto tracks in manipulator, and locked with screw jacks. Horizontal welds in hull assembly are made at this station

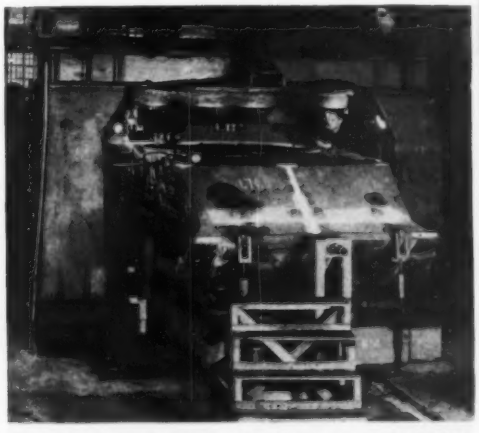


Machining operations are performed while welded hull assembly is fastened to bogie. At machine, hull and bogie are lifted off wheels, dropped on stands, jacked until locating pads on hull are square with spindle traverse. Operation: Milling suspension-bracket pads

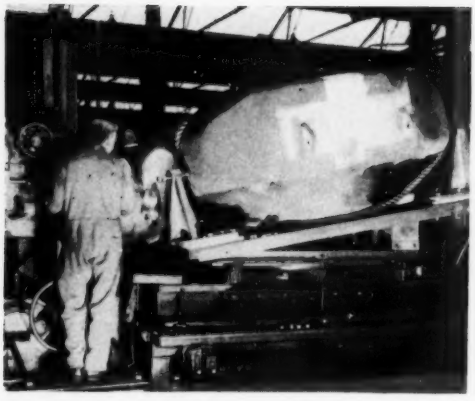
Hull assembly is jigged on a bogie and is then transferred to a rotary manipulator. Here the nose armor is being added to the 15-ton hull assembly



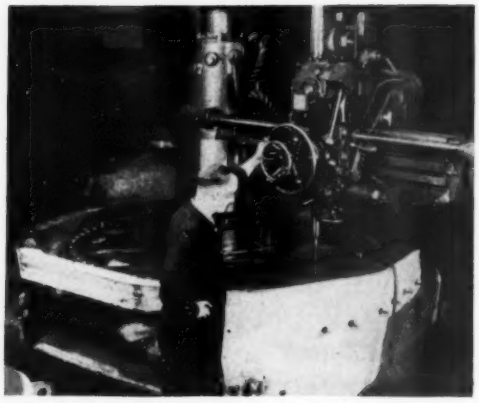
Universal manipulator provides tilting and rotary movements to joints not reachable in rotary manipulator so downhand welding can be finished. Platform of manipulator pivots about its cross axis, and each end has trunnion mounted fixtures for rotating the hull



Roof plate is bored and faced with hull in a special bridge-type machine. An 8-ft dia head has two tool slides

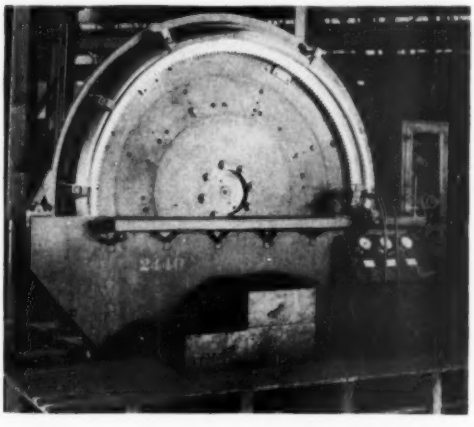


Revolver port is bored at compound angle to centerline of cast turret. Piece is located on fixture by a pilot entering machined recess for rotation ring. Fixture is tilted on rotary table by means of screw jacks



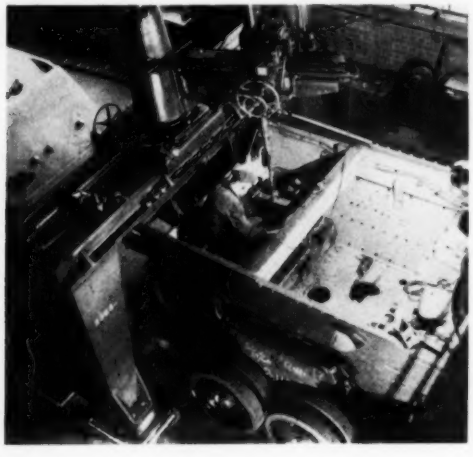
Radial drill has column mounting modified for attachment to jig plate that fits machined recess in base of turret. Then 47 holes are drilled, reamed, tapped, and spotfaced to permit fastening the raceway

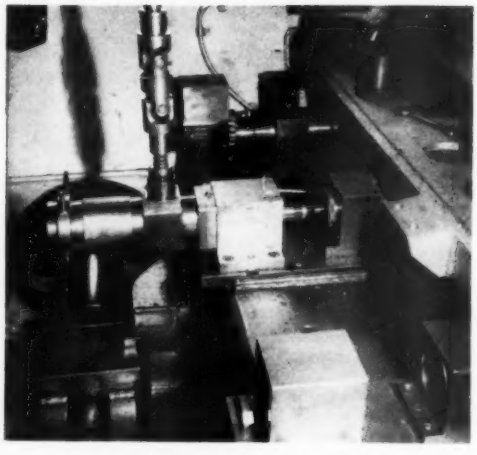
Right
Ball track of the raceway is flame hardened 3/16 in. deep by rotating component slowly past an oxyacetylene flame and water-quench jet. Distortion is virtually eliminated. Finally, the track is polished .Grinding is not permissible



Below
In hull assembly, holes for engine and gearbox suspensions are drilled and tapped under bridge-type radial drill. Holes are jig drilled, the jigs locating from the bores in the final drive brackets

Lower Right
Right-angle attachment on bridge-type radial enables drilling horizontal holes for fan-shroud mountings. Drive is taken from the machine spindle through a universal-jointed shaft. Jig for shroud holes has four stations





ROUND TABLE

Lost Diamond Mystery

"I'm as mad as a wet hen!" stormed Ed, slamming down into Al's spare chair. "Of all the asinine things for a man to do. How could Michner lose a diamond, and then say he didn't know how it happened?"

"Still harping on the mystery of the lost diamond, eh, Ed? Why couldn't it have vanished—it's pretty small. What's the story? Do you think somebody stole it?"

"No, Al, I don't. Michner spent an hour trying to find the thing, and he doesn't look like a thief to me anyhow. He's just a guy with a dumb streak, and I don't see why the company should have to pay for his dumbness."

"Well, what did he do?"

"One of the other boys told me how it happened. Michner was trying to dress that big wheel over there with it. Didn't use a star wheel first, just went at it with the diamond. Apparently, the diamond popped out of the braze—or was ground out—and it's gone."

"Shucks, Ed, that's no worse than a lot of other things that happen around here. How about the boys that smash expensive tools? Sometimes they're careless too!"

"Well, maybe it's because this is so much dough in such a little package. But any stupe knows better than to bang into a big, rough wheel with a diamond dresser. It's just rank carelessness with somebody else's property."

"Not necessarily, Ed. I remember once, when I was serving my time, a diamond dresser got ground down so much that the mount wasn't solid anymore. I lugged it out to the welder and he brazed it in—or burned it up, because I ground the whole new mount away and never did find the diamond again."

"Yeah, and what happened?"

"My boss was like you—he raised Hell all over the place and insisted that the welder and I had to split the cost. We darned near did, too—he was going to garnishee it from our checks until the super stopped him."

"Too bad he stopped it—might have taught you a lesson. Actually, though, the welder should have paid for it. If he didn't know how to braze in a diamond, he shouldn't have tackled the job. A guy who can't admit he doesn't know something ought to have to pay to learn."

"You're wrong, Ed. Every man's experience is gained partly at the expense of his employer. These things are just accidents, really—every accident can be traced to somebody's dumbness."

"You're nuts, Al. Michner should pay—or at least offer to. And I should make him pay—or fire him. You'd let a thing like this pass, eh? First thing you know, carelessness will grow and grow. And when I put it up to Michner, all he said was 'What the hell; I didn't do it on purpose.'"

"You know he didn't. He's a good man in general, isn't he? Write it off as a mistake — and watch to see that he doesn't make too many. That's all you can do."

SHOULD MICHNER PAY for his carelessness? How can such a situation be handled? Is there danger that it will grow? Your opinion or ideas will interest others. Discussions of earlier topics appear on later pages.

APPRENTICES work in their own shop, on production jobs, as . . .

IBM DEVELOPS ITS OWN TOOLMAKERS

6400-hour (3-year) apprenticeship on production provides embryo toolmakers and tool designers...Course is 92% shopwork, 8% class

BY E. J. TANGERMAN, Executive Editor

1. How long should an apprenticeship be?

2. Should work be exercises or production jobs?

3. How much "book learning" is advisable?

THESE three questions plague every company with an apprentice-training course. The answers will vary with company size, location, and needs, of course, but the ultimate criterion is whether or not graduates are successful.

IBM has, at its Endicott and Poughkeepsie, N. Y., plants, a 20-year-old toolmaker-apprentice course that answers the three questions in unusual ways. The course is 6400 hr, completed in a bit over three years, all work is for production tools, and 8% of the time is spent in "book learning". One indication of the soundness of the course is that many of the graduates are upgraded—to tool methods, production engineering, or supervision. Another is that 80% of the company's tool designers are graduate apprentices, as are many shop managers, tool buyers, and job analysts.

Unusual about this course is the fact that apprentices work in their own *production* shop, actually turning out tools, or tool parts, for use in the plant. They are under supervision of their own foremen-instructors, who in turn report to A. R. MacAlmon, manager of apprentice training.

The toolmaker curriculum is 92% shop training, 8% classroom instruction. It is open to selected high school graduates with a good technical background. An effort is made to include students who are obviously class leaders, and thus have leadership potential. The curriculum includes, in addition to machine-shop practice, mathematics, mechanical drawing, machine and tool design, heat treatment, maintenance, assembly, physical testing of metals, construction of small tools, jigs, fixtures, dies, gages, and gear cutting.

Applicants, after acceptance by the Personnel Department and the supervisor of apprentices, are placed on an 800-hr trial period, all spent in the apprentice shop. During this period, the apprentice is taught company policy and rated on his initiative, judgment, and mechanical aptitude. At successful conclusion of this trial time, an agreement is signed by the apprentice, his parent or guardian, and the company. Both length of training period and compensation are specified in this agreement.

Later work is divided into two periods, the basic and the final, of

about equal length. During the basic period, some time is spent in physical testing, heat treatment, machine maintenance, and tool engineering, all in the shops devoted to those fields and under specialist instructors. During the final period, 480 hr are spent on assembly work. Details of the program are separately tabulated.

Tests and Reports

Throughout the apprenticeship, monthly tests are given on machine-shop practice by the supervisor, and monthly shop ratings are given by the department manager or instructor in direct charge of the apprentice. The latter rating covers mechanical ability, quality and quantity of work, shop citizenship, initiative, attitude, and judgment.

Each week, the apprentice reports the number of hours he has spent on each operation of his training course, and these reports are transferred to his master card to show his exact experience at any time.

Classroom work in related subjects is also given on company time throughout the course, averaging 160 hr per year. Of the total related hours, more than 200 hr are on tool design. Safety training is also given as each new subject is undertaken.

Ratings on technical tests, shop work and classroom work are combined to arrive at the final rating for each apprentice. Monthly progress reports keep each apprentice informed of his ratings. Upon completion of training, the apprentice is graduated as a journeyman, and receives both a certificate and the set of tools he has used.

Starting rate for apprentices is about 40% of the average journeyman rate, with increases given each 800 hr, finishing at about 75% of the journeyman rate.

All apprentices automatically belong to the IBM Apprentice Club, which meets monthly and provides an opportunity for discussion of shop problems, for "talking on his feet", as well as for dinners, dances, and other social functions. Each apprentice is also eligible for the IBM Country Club (membership is $1 per year) with all its sports and recreational facilities.

• TRIAL PERIOD

TYPE OF WORK ASSIGNED	TERM	ASSIGNMENT
Filing, burring, straightening, use of hand tools, and simple layout	80 hr	Apprentice Shop
Drillpress work, such as layout, drilling, reaming, tapping, countersinking	80 hr	Apprentice Shop
Bench-lathe work, straight and taper turning and boring, to precision limits	120 hr	Apprentice Shop
Simple tool work and fabrication of special model parts	320 hr	Apprentice Shop
Shaper and milling work on special parts	120 hr	Apprentice Shop
Related Instruction	80 hr	Classroom

• BASIC TRAINING PERIOD SHOP EXPERIENCE

Advanced drilling, such as precision drilling, reaming, allowances for fits, dowels, etc.	120 hr	Apprentice Shop
Advanced turning on bench lathe, such as model parts, to close limits, threading with die to gage, etc.	120 hr	Apprentice Shop
Shaper and milling work, such as plain milling, indexing on parts and tools	160 hr	Apprentice Shop
Engine-lathe work, turning, boring, threading, etc., on tools and special parts	160 hr	Apprentice Shop
Surface grinding, cylindrical grinding, etc., on precision parts and tools	160 hr	Apprentice Shop
Advanced lathe work on engine lathe, such as precision turning, threading, machining of parts and tools	160 hr	Apprentice Shop
Advanced milling and shaping, such as spirals, racks, cams, special precision work, etc.	320 hr	Apprentice Shop
Advanced grinding work, precision tool grinding	160 hr	Apprentice Shop
Construction of dies, jigs, fixtures, special parts that require extreme accuracy and skill	720 hr	Apprentice Shop
Working as machinist's helper and repairman on various machine tools	240 hr	Machine Repair
Actual designing and detailing of miscellaneous tools for current requirements	240 hr	Tool Engineering
Physical testing of metals for tensile strength, hardness, etc.	80 hr	Metallurgical Lab.
Heat treating of steels, carburizing, annealing, hardening, etc., of steels and their alloys	80 hr	Heat Treat Dept.

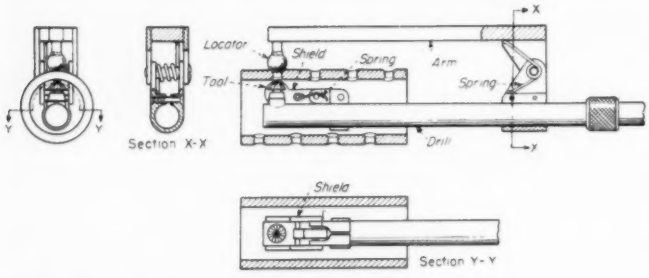
• FINAL TRAINING PERIOD SHOP EXPERIENCE

Construction of fixtures, such as the making of parts and assembling of all types of jigs	480 hr	Toolroom
Jig construction work, machining of parts, and construction of various types of dies	480 hr	Toolroom
Die construction work, machining of parts, and construction of various types of dies	720 hr	Toolroom
Gage work, construction of various types of gages as comparator, indicator limit gages, etc.	200 hr	Toolroom
Assembling various units and machines in final assembly division	480 hr	EAM Assembly

• CLASSROOM WORK IN RELATED SUBJECTS

	TYPE OF WORK	NO. OF WEEKS	HOURS PER WEEK	TOTAL HOURS
FIRST YEAR	Introduction to Tool Design	10	2	20
	Tool Design I	30	2	60
	Fundamentals of Modern Shop Practice	10	2	20
	Applied Shop Math	30	2	60
	Related Tests			20
SECOND YEAR	Heat Treat—Metallurgy	15	2	30
	Advanced Math	20	2	40
	Job Methods & Analysis	5	2	10
	Tool Design II	40	2	80
	Related Tests			10
THIRD YEAR	Production Planning—Tooling, Routing	12	2	24
	Industrial Organization	16	2	32
	Tool Design III	16	2	32
	Mech. & Elec. Principles	24	2	48
	Cost Analysis	12	2	24
	Related Tests			10

Practical Ideas



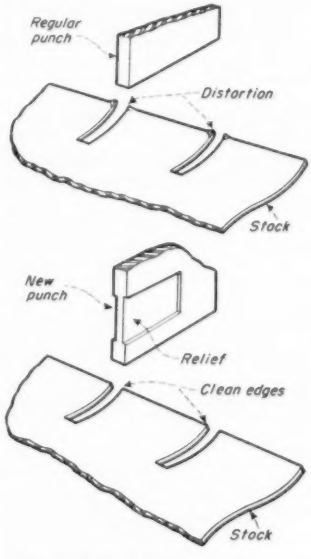
Dentist's Burr Adapted For Deburring Inside Holes

AIRCRAFT-ENGINE BEARINGS have small holes drilled through their walls for lubrication purposes. After drilling, these holes are simple to deburr on the outside, but deburring the inside edges is not an easy job. One way we have found to do this and similar work is to rig an ordinary dentist's burring tool to **slip inside the** bearing.

The illustrated equipment allows extending the burr inside the delicate bearings to do the job, yet does not allow damage to the bearing surface. A spring-loaded arm is attached to the shank of the tool, and this carries a ball locator welded into position exactly opposite the end of the burring tool. A small chamfering bit is used in the spindle of the tool to do the cutting.

The spring normally holds the two arms apart, but these are brought closer together by the operator when the burr is approximately in position. The ball locator is inserted in the outside edge of the hole first, insuring that the tool will not bite the bearing surface when the arms are closed up.

Two small side plates, mounted beside the chamfering tool, normally protect the bearing wall by extending beyond the end of the tool, but when the arms are squeezed together, this force compresses the springs that hold the plates out, which exposes the tool to the hole. The guard plates combined with the ball locator on the outside arm make the tool easy to use and accurate enough that little damage can be done to bearing walls. *Tom Brown, Middlesex, England.*



Relieved Punch Clears Formed Stock

HERE IS a notching job that presented us with quite a problem some time ago. We were notching formed stock in a die, and stripping the stock off the die after it was notched. Because of the shape of the cut, the edges of the notch were distorted as the stock was pulled from the punch.

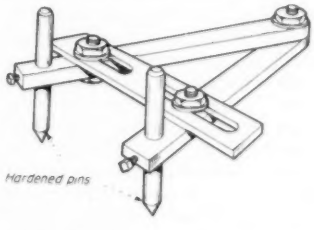
We solved the problem by milling shallow relief cuts in the sides of the punch, which allowed free pulling of the stock from the punch, and prevented the stock from binding on the punch. The cutting edge of the punch was left as it was, to make the notching cuts, but the relief was located about ¼ in. above this edge, so the punch cleared the edges of the stock as it fed into the die. Stock was easily pulled away from the punch in a sideways direction. *Cliff Bossman, Dayton, O.*

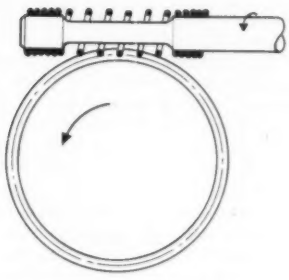
Circle Scriber Punches Centers, Too

TWO HINGED ARMS carry hardened and pointed pins in this design for a layout tool. The device can be utilized for scribing, punching, measuring, and gaging.

The two arms are drilled for bolts and also drilled to take the two pointed pins. The clamps can be screws, as shown, or can be wingscrews for quicker adjustment. The spacer plate is slotted to allow spacing the pins.

To provide equal projection of the pins from the arms, both are grooved circumferentially and the setscrews are pointed so the screws will nest in the grooves when the pins are in position. If desirable for close adjustments after the plate has been clamped, one point can be ground slightly eccentrically so the pin can be rotated in the arm to shift the position of the point. *John E. Hyler, Peoria, Ill.*

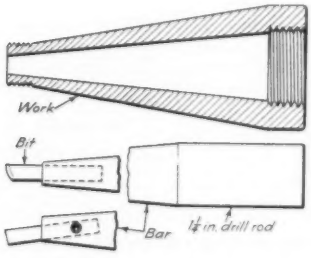




Spring Replaces Worm In Gearbox

CERTAIN POWER TRANSMISSIONS and gear boxes operating with relatively little power and subject to a great deal of vibration can be operated with a helical spring in place of the usual worm gear. The shaft is recessed through the length of gear engagement, and then the spring is wound to fit tightly to the shaft. The spring must be wound especially for the gear, being close-wound at both ends for gripping power, but spaced exactly at the pitch of the gear through the middle.

Best results seem to have been with gears made of laminated plastic. *Haim Murro, Jerusalem, Israel*



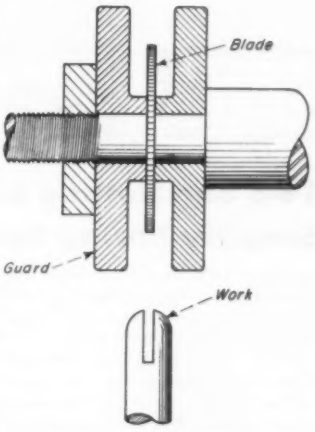
Tapered Bar Provides Husky Toolbit Support

BORING OPERATIONS often develop excess chatter, especially when the ratio of length of bore to bore diameter is large. We ran into the usual trouble when taper-boring an order of special brass fittings as illustrated.

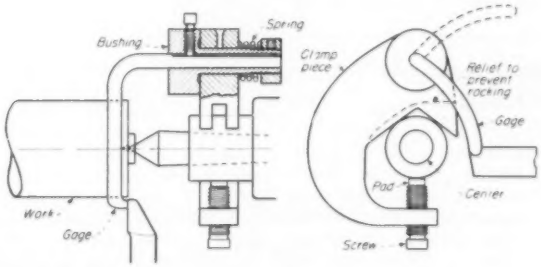
To cut chatter to a minimum and improve finish without using a special taper reamer, a tapered boring bar was made. The HSS bit was inserted in a drilled hole in the end of the boring bar and was ground to shape. The work was first step-drilled and then taper-bored with this bar. Results were excellent. *John J. Moffatt, Montreal, Canada.*

Sawblade Guard Acts as Gage

OFFHAND SAWING and slotting work, done with a machine-driven blade, can be made safer and swifter if a suitable guard is mounted on the arbor with the blade. The guard is made of wood or any scrap metal, shaped to clear the blade as deeply as necessary, and fitted between collars on the arbor. If desirable, the guard can be made into a gage, too, by cutting it as deep as the sawcut is to be. This was done when we were slitting the ends of rods, making the job accurate as well as safe.



The guard was hardened and ground to depth and profile, allowing the stock to be entered to exact depth and centered on the saw exactly. *Federico Strasser, Santiago de Chile.*

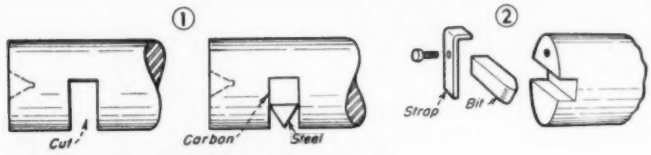


Lathe-Tailstock Gage Locates Bit for Facing

THIS GAGE, swung from the quill of the tailstock, is useful in locating a facing toolbit for cutting off the rear face of a workpiece, especially when stock must be removed to eliminate the center-hole.

A V-notched clamp is made to fit the quill, and is provided with a wingscrew or setscrew equipped with with a fiber pad so it will not mark the quill. A hole through this clamp piece takes the gage rod, which is held in place by a collar, bushing, nut, and spring. The idea of the spring is to allow swinging the gage down to the toolbit so it can be positioned, then the gage can be swung back out of the way of the job.

For jobs that require a datum face, from which linear measurements for shoulders and the like are made, the gage is a good reference. Such measurements are usually made from the headstock end of the work, but working from the tailstock end is often less complicated and faster. *N. Palmer, Paddington, Australia.*



Two Bar-Slotting Ideas Simplify Boring Setups

GETTING AROUND a broaching job when you are making boring bars is a practical way of reducing costs. Here are two ways to do it:

First, take a straight milling cutter and groove the bar past center at the location of the proposed toolbit. The gash should be the width of the toolbit. Then take a piece of carbon that is the same thickness as the toolbit, insert it in the slot, then insert a triangular-section steel filler piece as shown.

The space remaining is filled with bronze welding rod, making sure that adhesion all around the sides of the gash is good. Now the piece of carbon can be removed, a hole can be drilled and tapped for a setscrew, and a toolbit can be clamped.

The second idea is to simply cut a slot across the end of the bar to catch the toolbit. Clamping is done with a strap, held in place and tightened with a screw working into a tapped hole in the end of the bar. When the outer end of the bar does not require support, this method is good. The first method allows center support of the boring bar at both ends. *B. C. Lester, Wray, Colo.*

Stationary Leadscrew Gages Facing Jobs

ALMOST EVERY LATHE in the British Isles and in the U. S. A. has a thread-cutting indicator which shows exactly when the half-nuts can be engaged with the leadscrew to move the carriage for thread cutting. This is done while the leadscrew is rotating. However, I have found a way to use the leadscrew to advantage when it is not rotating; and I have never heard, at least, of anyone else doing just this thing.

The lathe I operate has 4 threads per inch, so the half-nuts can be engaged with the stationary leadscrew at every ¼ in. the carriage is racked along the ways. There are 32 divisions on the indicator, so a full revolution of the indicator means the carriage travels 8 in.

When I have a lot of gears to face to a definite length of hub, I clamp a facing tool in the post and rack the carriage along toward the headstock until the tool is within ⅛ in. of the chuck face. I then rotate the leadscrew by hand until a division matches the indicator hairline; then engage the half-nuts. Finally, I rotate the leadscrew until it comes to a dead stop against the end of the ways.

Now, I shift the tool with the slide until it touches a piece of paper held against the faceplate, and then I disengage the half-nuts and rack the carriage back into working position.

All subsequent traversing of the tool is done with the carriage; the slide adjustment is left alone in the traversing direction.

Pieces are tapped in when chucked to bear against the face of the plate. When the facing is done, the saddle is shifted until a marked index number turns to match the index hairline, and the nuts are engaged. Then cross-feeding is done with the cross-slide.

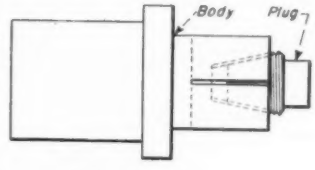
Parts come out exactly to the same length every time with this method. The thing that makes it easy is that the correct length can be guessed to the nearest ¼ in., then the carriage is moved to show the right dial number for final accuracy.

The same system can be applied to many machines for many jobs—boring holes to specific depths in a number of similar pieces, facing or chamfering edges of holes, etc. For making a cut that falls in a place where the half-nuts cannot be engaged, a dial indicator can be utilized—and even with this complication, the method is quite fast. *Thomas Gray, Belfast, N. Ireland.*

Tandem Fabrication Reduces Spline Cost

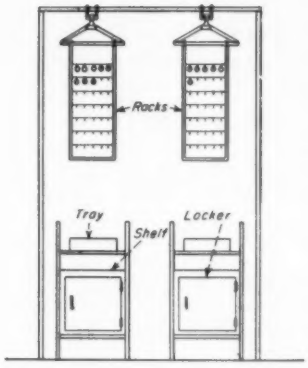
SPLINE BROACHES and gages to close tolerances, we have found, can be made easily and more economically by cutting them from the same piece of shaft. What we do is first cut the spline profile all the way down the shaft, then cut teeth into the broaching section and separate the two sections.

This method results in a tandem grinding job that means only one setup instead of two. After the broach and gages have been separated, the only different treatment necessary is that the gage has to be lapped slightly. *R. G. Vare, Holmsley, England.*



Simple Ring Chuck Is Expanded by Plug

HERE IS a simple adapter for second-operation work in a collet lathe. Rings and drilled work are chucked outside the split chuck, which is expanded by an ordinary pipe plug. The chuck is drilled and tapped to take the plug, with enough clearance allowed for expansion. Saw cuts are made after the tapping is done and the plug has been checked in the hole. *John H. Forsgren, Lakewood, O.*



Swivel Racks, New Benches Speed Plating Work

WITH LIMITED FUNDS and space available, we recently had to add to our plating area. One bottleneck in space seemed to be work tables which the girls used as benches to hold everything from cosmetics to themselves.

The illustration shows what we did to provide more room. Operations were speeded as much as 50% by building pipe racks that held plating racks on swivels over the benches. The swivels allowed the girls to fill both sides of each rack without moving from position.

The workbenches were equipped with lockers on the bottom, and with a single shelf under the work top that held trays. This worked out well, saving space and making everything considerably neater. *Frank Spicer, Dundee, Scotland.*

Modernized Drillpress Run By Motor

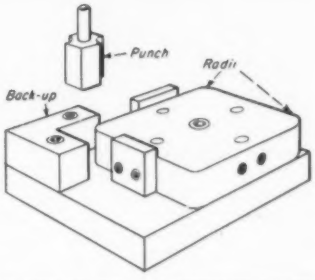
TO CONVERT an old belt-driven press for faster, more dependable operation, we placed a motor on a floor mount and drove the belt pulley directly from it. A gearbox and long transmission shaft mounted vertically operated from the motor to revolve the pulley, which transmitted power to the spindle pulley by means of a belt. The gearbox was actually an old automobile drive. *Olin L. Brage, Spokane, Wash.*

Four-Way Die Punches Corner Radii

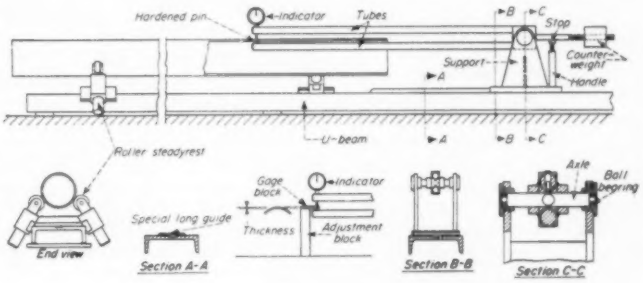
BECAUSE OF the high cost of blanking dies that include rounded corners, we made this versatile punch and die that will cut four different corners. Time can be saved by shearing the stock to size, then punching the corners with this rig.

The die is fitted with a heavy plate, the corners of which are formed to the required radii accurately. The original plate had 1-, ¾-, ½-, and ¼-in. radii. Two punches are required to match these corners, as one punch can only be formed to two radii.

For accurate guiding, a stationary punch backup is bolted to the die base, spaced to match the thickness of the dies. The die plate



is held by a single heavy capscrew and located roughly by two small plates that speed assembly. The idea saves punch material, storage space, and resharpening time because both punches and the die can be sharpened by simply grinding off the flat working surfaces. *Donald D. Amison, Providence, R. I.*

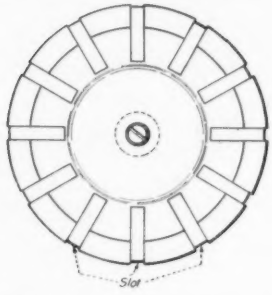


Indicator-Holding Fixture Inspects Tube-Wall Thickness

THIS LONG, but not particularly complicated fixture was built to gage the wall thicknesses of tubes 70 in. long, which were being turned and bored. The fixture allowed us to gage wall thickness within four thousandths.

A planed U-beam was mounted on a steady base and was fitted with two adjustable roller steadyrests to support the tubing. The measuring equipment was supported from a heavy yoke section fitted with ball bearings. This yoke, in turn, was carried on the U-beam and guided by a thin plate fitted to the top of the beam. The back end of the gaging beam was counterweighted to prevent its dropping down onto the support rail when tubing was not in position. The beam was prevented from swinging up too high by a simple adjustable jack.

To set the indicator for the proper reading of wall thickness, a gage block for the exact dimension was inserted between the hardened pin on the lower beam and the dial-indicator spindle on the upper beam, allowing us to set the indicator to zero for the proper dimensions. Although the beam was quite long, no weights or stresses were changed during the measuring cycle, so results were quite accurate. *A. Vetsch, Steffisburg-Station, Switzerland.*



Magnetic-Chuck Attachment Grips Rings Internally

THIN RINGS and similar workpieces can be gripped by a rotating magnetic chuck when this attachment is added. The device is a simple round piece of magnetic material, form-turned on the outside, bored out inside, and slotted radially. A hole drilled through the center of the face takes a setscrew that bolts the plate to a magnetic chuck.

Assembly is made to the chuck with a thin washer between the chuck and the attachment. After the ring material is placed around the chuck jaws, magnetic current is turned on and the magnetic force pulls the outer ends of the jaws towards the chuck, thus expanding the jaws to grip the ring firmly. The amount of deformation can be controlled by changing the thickness of the washer.

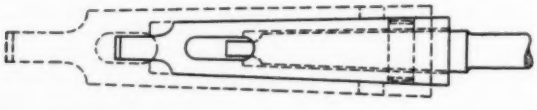
To release the part after turning has been done, it is only necessary to turn off the current. For special formed rings, locating plugs can be inserted in the outer edges of the chuck jaws. *Nobuo Arakawa, Tokyo, Japan.*

Steel Ball Checks Depths of V-Grooves

SCALE MEASUREMENTS usually are good enough for most of the checking of V-groove pulleys when they are being cut, but the accuracy of the groove faces themselves calls for better measurements. We check the pitch dimension on such grooves with a round ball.

After finishing all dimensions on a pulley to scale measurements, we select a steel ball that will contact the sides of the groove but not the bottom of the profile. Then we set the ball on top of the toolbit, resting against the groove, and back off the tool until the ball drops through. This gives us a measurement on our crossfeed dial, which can be checked against a master measurement.

By alternately machining and checking, the operator can get his grooves to the same dimesion quite rapidly. *R. S. Cowley, Seward, Nebr.*



Reamer Floater Improves Tail Alignment

CLOSE TOLERANCES can be held, and holes will be cut smoother and straighter with this floating assembly that holds taper-shank reamers. The setup is especially useful where drilling and reaming are done from the same spindle, and interchangeable chucking tools are used. The idea has proved successful on SAE 1045 steel forgings, welded assemblies, and castings. *William L. Holl, Canton, Ohio.*

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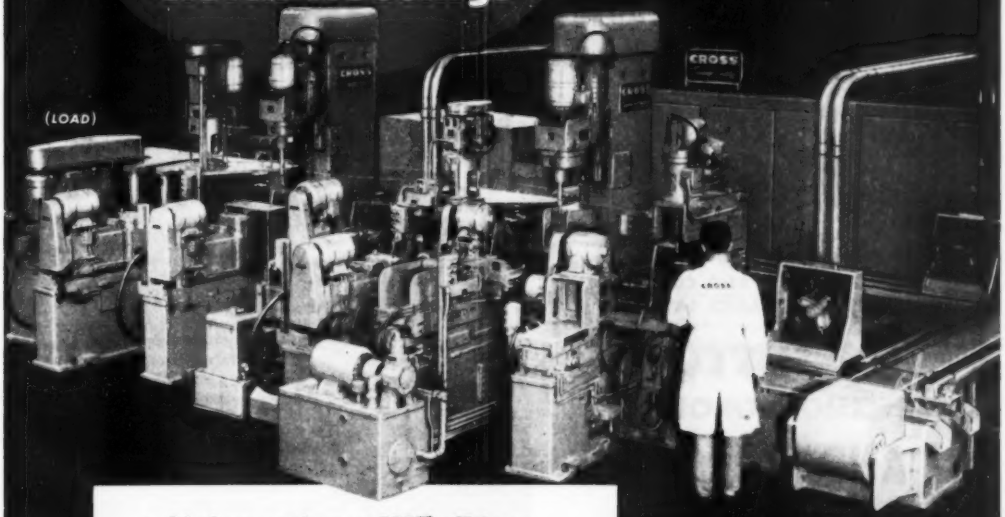

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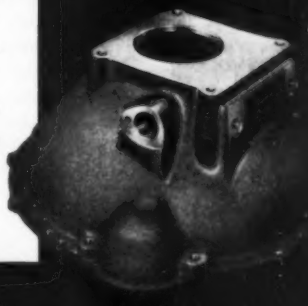

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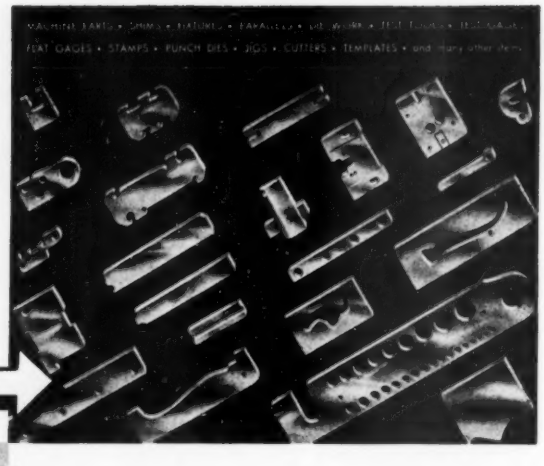

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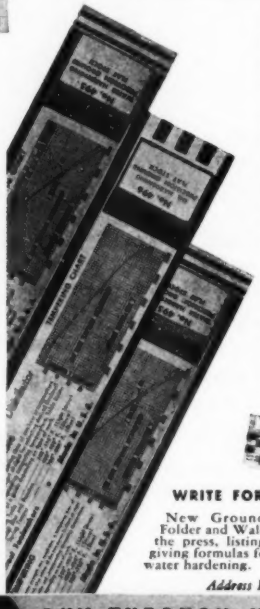

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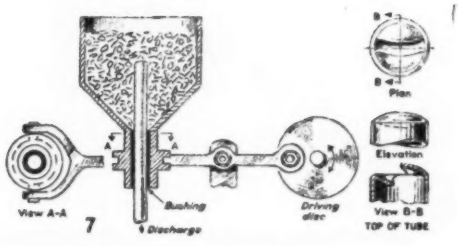
Sorters and Feeders...III

BY WILLIAM SCHWARTZ, Consulting Engineer



7

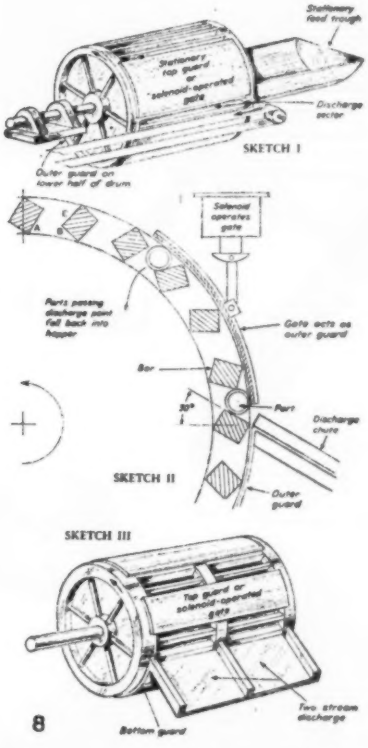
Blank Feeder Accepts Non-Uniform Parts

In this device, Fig. 7, applicable only to round, flat objects, the tube is stationary. The funnel reciprocates, driving the tube end through the material heap; at each downward stroke one or more parts will be passed through the slot in the top of the tube. Lubricant on the OD of the tube will dirty and contaminate the pieces handled. If this is objectionable, the bearing bushing must be dry. Parts which are too heavy will batter the end of the tube and burrs will reduce the number fed into it. Clearance between the OD of the piece and the ID of the tube may be sufficient so the design can be applied to parts not too uniform in size.

Selection Chart for Sorters and Feeders

Materials and Shapes	1	2	3	4	5	6	7	8	9	10	11
Round and Flat	X				X	X	X		X	X	X
Long Cylinders			X	X		X	X	X		X	
Cubes				X				X	X	X	
Irregular Shapes		X		X		X					
Symmetrical Parts having Projections			X	X		X	X	X	X		
Spheres	X				X				X		
Fragile or Brittle	X		X				X			X	
Soft	X			X	X	X	X	X	X	X	
Nesting or Tangling		X		X		X		X			
Delivery Rate over 100 parts per minute	X	X		X	X	X	X	X			
Delivery Rate under 100 parts per minute			X				X		X	X	X
Multiple Stream Delivery	X				X			X			

Best Applications of Designs Illustrated: The selections noted above can only be a rough guide to designers. Where several mechanisms could handle a given type the simplest designs have been noted; special considerations must be weighed in all cases.



8

Bar-Sided Drum Hopper Discharges Onto Belt

The design in Fig. 8 can be used in the random discharge version (shown in sketch I) for parts which tangle, as pieces not discharged are thrown back into the heap at the bottom. Sketch II shows the arrangement of the bars; and the outer guide ends at the discharge slide or belt.

Sketch III shows how the design can be adapted to discharge more than one stream of material by dividing the openings with separators, but parts which tangle would clog the openings. Cylindrical objects can be discharged at a timed rate or synchronized with other mechanism according to the operation of the gate solenoid.

Looking at Sketch II upside down, the bottom pair of bars at the centerline will be seen to form a funnel shape between surfaces *A* and *B*, which facilitates the parts dropping onto surface *C*, on which they ride in the lower half of the drum. An inner guide may be fitted into the upper half of the drum, in which case the spaces between the bars will remain filled until each slot passes the discharge point and finds the gate open.

Straddle Broached 2 flats
Straddle Broached inside and outside on bosses
Straddle Broached 4 flats
Broach flat
Broach deep slot
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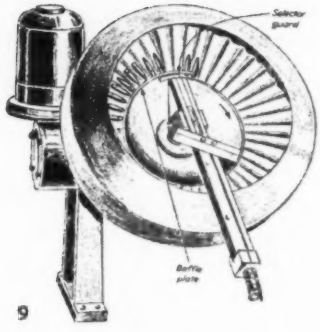
Sorters and Feeders...IV



9

Drum-Type Hopper Feeds At Rapid Rate

One of the oldest and most popular feeding and sorting devices, this commercially available hopper, Fig. 9, has been adapted to a variety of symmetrically shaped parts. The wedge-shaped blocks fastened to the rotating ring are spaced to permit the part to fall between them when they pass under the supply stored inside the cover. The baffle plate inside the rotating ring is stationary, being attached to the fixed central shaft which also supports the discharge track. This baffle plate keeps the 50-cal. bullet cores illustrated from falling inwards until they are carried up to the end of the track.

The selector guard attached to the baffle plate allows bullet cores oriented point first to pass into the track, but rejects those having their blunt end down. For bulky parts which must be fed at a high rate, this hopper must be equipped with an auxiliary device to dump batches of parts inside the cover every few minutes, since the cover cannot hold a very large supply.

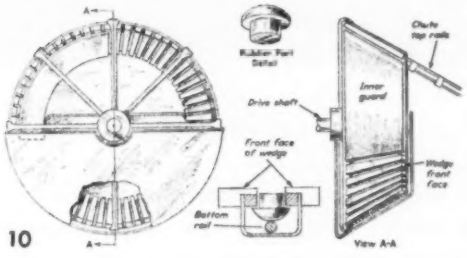
This hopper is usually driven by a constant-speed motor, a feed limiting device or escapement being used to regulate the discharge. Feeds as high as 300 parts per min. can be obtained, but light plastic or sheet-metal objects must be discharged at a much lower rate.

Squirrel-Cage Hopper Sorts Rubber Parts

Rubber parts are difficult to sort because of their high coefficient of friction and resilience. Rubber casters, Fig. 10, pressed into the bottom of small electrical appliances, could not be handled in any device dropping them even a short distance, and their center of gravity is such that orientation by movement would be difficult. However, lying in the outer cover of this hopper, they are tumbled until each piece happens to orient itself with the shank down. A slot passes under them, and they drop into it when other pieces permit.

As the hopper turns clockwise, the caster lying with its shank in the slot between two wedges is carried into the upper left quadrant, where the inner guard keeps it from falling out. The inner guard ends at top center, where the chute picks up whatever pieces are in each slot and removes them. The weight of the piece is taken by point contact with the bottom rail, the top rails being stabilizers.

This type of chute is best for rubber and other high-friction material because it is open for clearing jams, has little friction resistance to movement, and is easy to fabricate. It will handle cubes, long cylinders and other shapes, and is especially good for material that has a high coefficient of friction.



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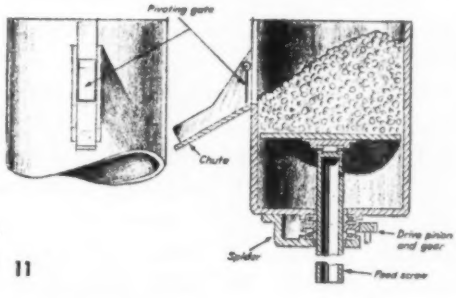

11

Piston Hopper Proves Best for Fragile Items

Materials too fragile to be tumbled or agitated can be fed from the hopper shown in Fig. 11. The chute angle should be approximately equal to the angle of repose of the material. The drive pinion may be driven by a variable-speed motor and gear train, or the screw feed replaced by a hydraulic cylinder. A surprisingly constant flow of material can be maintained, but additional regulation by adjustment of the pivoting gate is difficult unless accompanied by control of the piston feed.

TAKE A LESSON FROM THE BIG USERS... TRIPLE PRODUCTION WITH ROBERTSON WHEELS

Cost-conscious and production-wise manufacturers the country over have been quick to take advantage of Robertson Wheels . . . to benefit from the longer wheel life, increased production and lower power consumption they make possible.

The following experience of a motor shaft manufacturer is typical of many users of Robertson Wheels.

Using a conventional wheel on his Landis Cylindrical Grinder to remove .015″ to .020″ stock from SAE 1040 steel, and held to a tolerance of plus .001″ minus .000″, he was able to finish only 10 pieces per wheel dressing. Wheels were being worn out excessively fast by too many dressing and truing operations; and production was slowed by the resulting work stoppages.

A Robertson Engineer, called in for advice, recommended substituting an 18″ x 2″ x 5″ RA 462-MV Robertson Wheel. With no other change in grinding method, *production immediately jumped to 30 shafts per wheel dressing* . . . a threefold increase in production, and longer wheel-life to boot!

The manufacturer, of course, was delighted—as so many are, once they find how Robertson Vitrified and Resin-Bonded Grinding Wheels take the tough jobs in their stride. For proof, *blueprint* your grinding problem and let us recommend a wheel for the job. Then compare the results you get from a Robertson with those of a conventional wheel.

Today, some of the country's largest manufacturers are using Robertson Wheels and Robertson engineering services. Their names will be sent on request.

ROBERTSON MANUFACTURING COMPANY

TRENTON 5, NEW JERSEY

Resin-Bonded and Vitrified-Bonded Grinding Wheels • Mounted Wheels • Segments

American Machinist

REFERENCE BOOK SHEET

Chemical—Waste Disposal

BY E. G. MEITER *
Director, Industrial Hygiene Div.,
Employers Mutuals of Wausau, Milwaukee

As the national program for minimizing stream pollution develops, it becomes increasingly important that machine shops develop methods for proper chemical-waste disposal.

Every industrial plant should make a study of statutes governing sewer and stream pollution. Where required, formal approval of plans should be obtained from pollution-control authorities. If this is not done at the start, costly changes in plant and equipment may later be necessary in order to meet statutory regulations.

The waste-disposal problem should be considered at the time the plant is designed. If the plant is located in a residential area and the loading platform is accessible to children, the platform should be fenced off, to keep out the public. Chemical wastes provide an attractive nuisance for children.

CONTROL MEASURES

Disposal of Cyanide Wastes—In machine shops the operations producing cyanide wastes are:

1. Electroplating of metals.
2. Case hardening of steel.

Cyanides are the most toxic waste products produced by industry. Uncontrolled discharge of untreated cyanide-bearing wastes has frequently menaced public water supplies and resulted in damage to livestock, fish and municipal sewage-treatment plants. Wastes from metalworking plants are deleterious to sewage treatment. Cyanides as low as one part per million are toxic to biological activities.

One of the newer approaches to the cyanide-waste disposal problem is the substitution of pyrophosphate salts of metals for the metal cyanides, resulting in the complete elimination of cyanides from the plating bath. These salts are relatively non-toxic and much of the pollution hazard of cyanide baths is removed. The toxicity of rinse waters is also greatly reduced.

Cyanide Wastes from Plating Rooms—Wastes from the plating room arise from two sources: first, a continuous waste consisting of the overflows from the hot or cold rinse waters; and second, the intermittent wastes or batch dumps of concentrated solutions.

The method to be adopted for disposing of cyanide wastes from a plating room depends to a great extent upon local conditions. All federal, state and local regulations concerning such disposal should be determined and observed in all cases.

A discussion of some typical disposal methods follows:

1. *Disposal by dilution.* Dumping of plating wastes into the nearest stream is not recommended and should be considered only under exceptional circumstances.

2. *Disposal by ponding.* Where ample land is available, ponds or lagoons are the cheapest and simplest method of plating-waste disposal. Such ponds should be constructed with no overflow to a stream and must be situated away from any sources of water supply. They must also be protected to prevent access by either humans or animals.

At best, ponding is only the next step better than discharge direct to a stream, and should be considered only as a temporary measure pending more positive means of control.

3. *Treatment with sulfuric acid.* Conversion of cyanide to volatile hydrogen cyanide gas has been used effectively. The gas is blown up a stack. The sludge containing insoluble cyanide precipitates is removed, and the supernatant liquor is bled slowly to the receiving stream or outlet.

4. *Alkaline-chlorination.* Oxidation of cyanide to cyanate, carbon dioxide, and nitrogen compounds with caustic soda is a method of treatment that has recently come into widespread use and has been called "The Model System."

Further oxidation of the cyanate to carbon dioxide and nitrogen compounds occurs if chlorine is added beyond the amount required for the first stage of the

The clear liquor resulting from the treatment runs from one to three parts per million of free chlorine, is free of cyanides, and is mildly alkaline. It may be discharged into the city sewer system or a stream. The sludge cake can be trucked to a disposal dump.

5. *Electrolytic oxidation.* Destruction of cyanide and the simultaneous plating out of some of the metals by electrolysis of hot aqueous plating solutions is a known treatment that has never gained widespread use.

6. *Conversion of cyanide to thiocyanate.* Conversion of cyanide to the less toxic thiocyanate may be accomplished by the use of calcium polysulfide, available commercially as common lime sulphur.

7. *Use of ferrous salts and lime.* Removal of cyanide and plating wastes by this method has the disadvantage that discharge direct to a stream is prohibited because of the highly colored effluent.

Cyanide Wastes from Case Hardening. Work hardened in molten salt is quenched in either oil or running water. Cyanide content in these rinse waters runs as high as 50 to 100 parts per million and should be treated by one of the methods described above.

Spent salts should not be hauled to a dump where they may be accessible to humans or animals.

Cyanide Drums. Failure to prepare non-returnable drums properly for disposal may create serious hazards for janitors and others.

In disposing of fiber drums, the top should be replaced and sealed, and the container should be marked "POISON—THIS CONTAINER MUST NOT BE RE-USED." Then the containers should be burned in a well-ventilated incinerator, or on a dump remote from buildings.

Empty metal drums should be filled with water and allowed to stand for at least 15 min. Empty the contents and refill drum half full for rinsing. Repeat as many times as necessary to remove all cyanide deposits from the drum. After an inspection shows that there are no salt deposits remaining, remove the "POISON" labels and mark "WASHED" on drum. The drums should then be discarded to a dump or junk yard.

OTHER WASTES

Inorganic acids such as sulphuric, hydrochloric and nitric are neutralized with commercial grades of limestone, quick lime, calcium hydroxide, caustic soda, sodium carbonate, and byproduct alkalies. This neutralization may be conducted in lagoons or tanks.

Where space is available, lagoons or ponds are provided for collecting, mixing, and neutralizing the larger quantities of acids. All acid-treatment lagoons should be located in areas where the spent acids will not produce corrosion damage to underground structures such as telephone lines, electric power lines, water mains or underground structures.

Tanks or basins for acid neutralization are more expensive per unit volume than lagoons, but their greater efficiency permits smaller volume for the same amount of waste, so their cost of installation is less.

When treatment tanks are used, the clear liquor flows to the city sewer system and the settled sludge is hauled to a dump.

Alkaline Wastes. Alkaline wastes may be neutralized by waste acids, which are usually produced in larger amounts. The slurry is dewatered and hauled to a dump.

Organic Solvents. Both non-flammable and flammable volatile solvents are used for removing oil or grease from metal parts. The latter are usually high flash-point solvents generally known as "safety solvents." Proper disposal methods for each class of solvents are:

1. *Non-flammable solvents.* Trichlorethylene and perchlorethylene are used. Both of these solvents can be completely recovered with commercial stills, or the solvent may be recovered by distillation in the degreaser itself. If solvent is reclaimed in a gas or electric machine, the temperature of the residual oil may reach its flash point. The potential fire hazard of lower flash oils should be recognized.

2. *Flammable solvents.* Flammable solvents should not be discharged into sewers, if for no other reason than to prevent explosions. Routine tests should be made of plant sewers with a combustible-gas indicator.

Non-missible solvents, such as petroleum types, and large quantities of missible solvents, should be disposed of in a burning pit; or sent to a solvent recovery plant for processing.

* *Speaker at National Safety Congress, 1950*

Find out for yourself....

why people who try it buy it!

You've used regular "mikes" for such a long time you'll be amazed at the downright accuracy and plain honest-to-goodness convenience you can get with this CONSTANT PRESSURE, INDICATING MICROMETER. Just try it and you'll know why so many are buying it!

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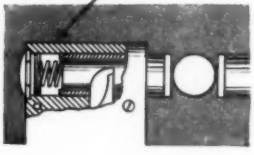
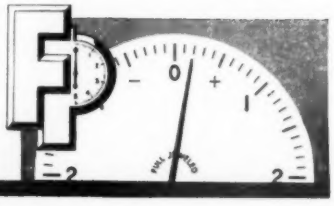
You don't have to take our word for it. Find out for yourself. Ask to see the Federal MIKEMASTER . . . and to try it on your work. Write to Federal Products Corporation, 1123 Eddy Street, Providence 1, R. I.

You'll appreciate the convenience of reading the Indicator instead of barrel graduations. The *constant pressure* of the anvil means constant measuring pressure every time.



FEDERAL

Largest manufacturer devoted exclusively to designing and manufacturing *all types* of DIMENSIONAL INDICATING GAGES



TALKING SHOP

Tracer Finds Wear

RADIOACTIVE ISOTOPES have been used in England to "tag" bearing wear accurately. CI bushings 17 in. in dia, running on CI sleeves, too massive to be irradiated, were equipped with ⅛-in. sleeves. These were irradiated for five weeks, then set aside to allow activity of impurities to decay for a week. Thus remaining radioactivity was almost all that of the iron. The bushing was installed in a pump and run in briefly. Four full-load tests were run at different temperatures, samples of the oil being removed after each test. These samples were burned to increase about 2000 times the concentration of radioactivity in resulting ash, which of course contained worn iron from the bearing as an oxide. X-ray film exposed to the ash was compared with that exposed to known radioactivity samples. Accuracies claimed are 0.1 in. to 2.5 in., depending on the amount of ash in the oil sample.

Syracompanies

MANUFACTURERS ASSN OF SYRACUSE, N. Y., provides a Buyer's Guide—a directory of manufacturers in Onondaga County. As the county is very diversified in products, the directory is an unusual one. Included are four pages of makers of fabricated metal products, five on machinery, five on electrical machinery, and one each on transportation equipment and instruments—over half of a total of 28.

Press Threading

GE's APPLIANCE & MERCHANDISE DEPT. has developed a simple rolling fixture for a No. 21 Bliss press, to generate "threads"—two spiral grooves 0.020 in. deep in 0.260-in. dia fan-rotor shafts. The fixture rolls the shaft down past two Carboloy blades set at the proper helix angle. HSS blades had a life of 60,000 pieces (10 regrinds), while the carbide gives 200,000 pieces per grind.

Sound Cast

STEEL CASTINGS can be made radiographically sound without recourse to padding or chills, provided the distance from the perimeter of the riser to the edge of the plate is 4½ times the casting thickness. Or so says the Naval Research Lab in a new report, based on studies of steels having 0.20 to 0.35% carbon, cast as plates with a width-thickness ratio of at least 3:1. Risers should have diameters three times the casting thickness, but do not need to be extra large.

Portable Strain Test

BUCYRUS-ERIE TESTS its huge power shovels and cranes on the job. A complete strain-testing lab is mounted on a truck that can be driven up close. Pear-connector sockets from each strain gage are mounted on a board bearing a profile of the part under test in the same spot as the strain gage is mounted on the part itself. This helps engineers to avod errors in recording data from the various strain points on the test part.

Husband Promised

SUGGESTION to metalworking plants luring female help is embodied in the ad from the *Washington Post* reported by the United Press: "Secretary. Cocktails at 5. Employer guarantees husband in six months."

Wire Sleeve

AT NACA, Richard Kemp found it unsatisfactory to weld strain-gage wires to lead-in wires for high-temperature research on gas-turbine blades. The lead wires are 5 in. long by 0.010 in. in dia, while the gage wires are only 0.001 in. So he flattened the end of the lead wire to about 0.003 in. thick, then curled the flat axially in a small die to make a sleeve. This could be swaged readily around the small strain-gage filament wire. They have worked up to 1500 F to record stress oscillations up to 1250 cps or higher.

Locked Feed & Speed

DETROIT AUTO BUILDERS are specifying more "ignition-style" locks for speed and feed-rate control knobs. These permit the setup man to adjust machining rates according to methods and time-study specs — then lock them.

Operator's productive capacity is determined by his ability to turn out parts at the proper conditions for the job and not by varying rates at the expense of poor finish or physical specifications which might get by inspection. Tool life, too, can be more acurately predetermined if rates are fixed, thus preventing operators from doing 8 hr work in 4 to 6 hr at the expense of tools.

Alert Snoozer

OUR RECENT ITEM anent sleeping on the job (*AM*, Jan. 8) brings a corollary from the chief engineer of a roller-bearing company. They hopper-feed rollers into a grinding machine. Occasionally, one goes down wrong end first and causes trouble. The operator keeps the hopper filled and catches these strays in the feed chute.

The night operator sits on his stool with his eyes shut—but the chief engineer says he never misses a reversed roller. He doesn't even open his eyes to remove it from the chute; apparently his ear is attuned to the proper "click" or "dead-center squeak"—and when it changes, he comes alive.

News of Metalworking

McGraw-Hill WORLD NEWS

VITAL EXPORTS BANNED—To preserve enough raw material for local industries and a new arms factory to be opened soon near Cairo, Egypt will ban exports of copper, iron, aluminum, Duralumin, and magnesium, in any form. Exportation of crude zinc, lead and manganese is permitted.

STEEL USE CUT—Deliveries of sheet steel to the British auto industry will be 15% less in the first quarter 1951 than in the last quarter of 1950, because of a fall in imports of sheet steel, and needs of the rearmament program. Estimated output of autos this year: 460,000, a drop of 63,000 from 1950.

AFRICAN AUTOS—German firm of Heinkel will build a factory at Kempton Park, near Johannesburg. Machinery for making complete six-cylinder Veritas cars will be imported from Germany. Price of car: about £500 retail. Production should begin in about nine months.

ZIRCONIUM PRODUCED—Production of zirconium metal on a commercial scale has been initiated by Murex Ltd., Rainham, Essex, England. Sheets down to .005-in. thick, 6-7 in. wide, and 2-3 ft long are being made. Rods down to 2mm dia can be supplied. Zirconium is used in electronics as grid emission inhibitors and can, in many cases, replace tantalum or molybdenum.

20% Less Steel for Autos and Consumer Durables in 2nd Quarter

WASHINGTON—Makers of automobiles and a long list of consumer durable goods are going to get 20% less steel during the second quarter of this year. And during the third quarter they'll be cut back at least 30% on their steel consumption. The object: to free steel for defense needs, essential civilian requirements, and ". . . many small industrial concerns . . . [which] . . . have been unable to obtain their proportionate share of materials."

National Production Authority chief Manly Fleischmann this week also announced second quarter copper and aluminum cutbacks along with this first cutback order on civilian uses of steel.

Fleischmann promised that NPA would shortly list the specific end products which come under the new steel order. Broadly, though, Fleischmann said the list covers: furniture and fixtures; utensils and cutlery; household appliances; autos, bicycles, boats and other transportation items—but not including trucks and buses; jewelry, games, novelties and other personal items; and "miscellaneous consumer goods such as coin operated amusement machines."

• **NPA's second quarter cutbacks** on copper, aluminum and steel, based on average quarterly use during the first half of 1950, now are planned as follows:

Aluminum—Continue the "across-the-board" 35% cutback made effective March 1 on all fabricators of aluminum.

Copper—Cut back users 25% during the second quarter, a further cut from the 20% cutback that is effective for March.

Steel—Require manufacturers or assemblers of finished end products to cut consumption of steel by 20%.

End-use limitations—Continue the bans on the use of copper and aluminum in "less essential items and for nonfunctional purposes."

There is to be no specific limit, however, on the number of units a maker can produce.

The forthcoming orders on steel would require that the auto makers and others consume at least the same proportion of "conversion" steel used during their base period.

• **Supporting figures** on the steel cutback were fuzzy. Fleischmann's statement said that steel needs during the second quarter for "defense and defense-supporting programs" amount to "over 5 million tons of finished steel products alone, or about 28% of the available supply." What this seems to mean: about 28% of finished steel will be going into (a) military hardgoods and (b) allocation programs guaranteeing steel for expansion of power, oil production, and rail equipment.

NPA's steel cutbacks on durables are expected to free "about a million tons of additional steel" during the second quarter. But no one was sure just how this supply would be split between military, essential civilian, and small business users.

Correlation of Production Techniques With Military Requirements Is Sought

NEW YORK—An industry-military conference aimed at correlating known production techniques with military needs will open the American Society of Tool Engineers' annual meeting here March 14 at the Hotel New Yorker. The conference will set the theme, "Mobilization of Production Know-How," which will key the three-day meeting.

Representing the armed forces in the open forum discussion will be: Lt. Gen. Kenneth B. Wolfe, Air Force chief of staff for materiel; Col. John S. Walker, district chief, New York Ordnance District, U. S. Army; and Capt. C. L. Helber, supervising inspector of naval materiel for New York, U. S. Navy. Roger F. Waindle, ASTE vice president, and general manager of Industrial Products Div., Elgin National Watch Co., will preside.

Technical sessions will open the meeting proper on Thursday, March 15. A total of 34 papers will be presented. Tours have been scheduled through nine nearby plants.

Featured speaker at the banquet session of the meeting on Friday evening, March 16, will be R. F. V. Stanton, executive vice president and general manager, American Machine & Foundry Co., and former chief of the Army Ordnance Small Arms Division at Hartford, Conn.

Boeing Tests Titanium

SEATTLE—Experiments with forming and machining of titanium by Boeing Airplane Co. here indicate a possible 43% weight saving in substitution of titanium and its alloys for stainless steel in airplanes. Machining operations of titanium bar, including drilling, tapping, reaming, turning, milling, grinding, and thread chasing have proved satisfactory. Sheet has been formed satisfactorily by power-brake, drop-hammer, spinning and hydraulic press operations.

Here Are Facts on WSB's Fifth Round 'Catch Up' Wage Policy

WASHINGTON—This is what's in Wage Stabilization Board regulation No. 6—the 10% fifth-round "catch up" wage policy. WSB recommended it to Eric Johnston, economic stabilizer, by a majority vote of the public and industry members over objections of labor members.

Duration—Until July 1.

Wage increases—General boosts to labor groups, with prior WSB approval, up to 10% of the level of first pay period ending after Jan. 15, 1950, with reconsideration of the 10% ceiling in May in light of April 15 figure of BLS's consumers' price index.

Wage level—The 10% boost is applied to the average straight-time earnings received by employees in the group during the base payroll period, including incentives, commissions, regularly paid bonuses and night shift premiums.

Figuring the 10%—Up to the freeze date, Jan. 25, you charge against the 10% only general wage and salary increases which raised straight-time earnings of the group one percent or more. You don't count individual adjustments based on merit, promotion, length of service, etc., nor increased cost "fringe" benefits. After Jan. 25, you charge against the 10% not only the general wage and salary increases, but also the increase in cost—pro-rated—of benefits like night shift bonuses, overtime premium pay, vacations, holiday pay, pensions, insurance and health and welfare benefits paid by the employer. Individual increases are still excluded.

Reports—No WSB approval needed for increases within the 10%, but a report containing the calculation must be filed within 10 days with nearest wage-hour office.

Appropriate unit—This formula applies only to general increases for groups of workers. Executive, administrative and professional employees must be separated from other salaried employees.

Abnormal base period—You may apply for a different base period if the Jan. 15 base is abnormal because you had no payroll period ending then, or you weren't in operation, or for other reasons.

Manpower cases—In "rare and unusual" cases, increase above 10% will be considered if necessary to hold workers in areas of serious manpower shortage.

Pension policy—WSB has under consideration a special policy for pension and health and welfare plans.

French Machine Tool Builders Represented Here

NEW YORK—The firm of C.I.T.E.R., Inc., has been formed here at 445 Park Ave., sponsored by the Banque de Paris & Pays-Bas and Banque Francaise du Commerce Exterieur, to promote trade from France and the French Union to the United States by establishing jointly owned enterprises between French and American business interests.

The firm will serve as agents here for the following French machine tool manufacturers: Ateliers, G.S.P., L'Outillage R.B.V., and La Precision Moderne, of Paris; Societe Somaco, Societe Parisienne de Machines-Outils, and Etablissements C. Gambin & Cie, of Seine; Etablissements Sculfort-Fockedey, Vautier & Cie, of Nord, and Etablissements Gendron Freres, of Rhone.

J. G. Devys, former president of American Industrial Development Corp., heads C.I.T.E.R., Inc.

Mergers & Purchases

• **Barrett-Cravens Co.**, Chicago, has merged with Crescent Truck Co., Lebanon, Pa., manufacturers of electric industrial trucks and tractors. Crescent will be operated as a division of Barrett-Cravens. Engineering and manufacturing operations will continue at Lebanon.

• **Parker Stamp Works, Inc.**, Hartford, Conn., has purchased Schoder & Lombard Stamp & Die Co., New York, manufacturer of steel stamps, dies, plastic molds and allied products.

• **Rockwell Mfg. Co.**, Pittsburgh, has purchased Pittsburgh Valve & Fittings Div. of Pitcairn Corp., and Pittsburgh Valve & Fittings Corp., a subsidiary of Pitcairn. Pittsburgh Valve is located at Barberton, Ohio. The plant will be operated as one of Rockwell's Meter & Valve divisions under direction of L. A. Dixon, vice president. R. G. Caouette will become general manager of the Barberton property.

• **Ohio Electric Mfg. Co.**, Cleveland, has purchased all tools, patents and rights to manufacture the Taylor & Fenn line of drilling machines made by Taylor & Fenn Co., Hartford, Conn. Tools, dies and fixtures are now being transferred to Ohio's Cleveland plant.

• **Allied Products Corp.**, Detroit, has purchased Michigan Powdered Metal Products Co., Inc., Northville, Mich., which now becomes a wholly-owned subsidiary of Allied.

Training Plan Seeks to Offset Manpower Shortages

NEW YORK—To train people for new jobs or bigger jobs to offset manpower shortages that will be faced by industry and business, 76 colleges and universities are offering their facilities—to be used with the facilities of industry and business—in evening courses all over the country.

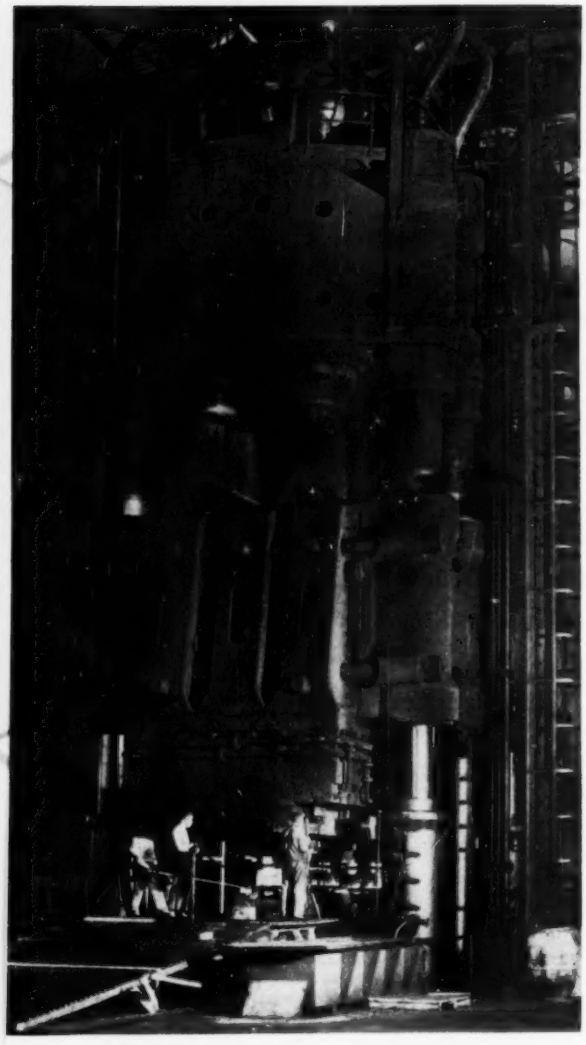
The 76 schools, all members of the Association of University Evening Colleges, are located in the chief urban centers, close to the industrial plants and commercial establishments that will face manpower shortages.

The association offers to all of its members any training program that is developed by any college or group of colleges in cooperation with industry and business.

Courses will include subjects concerned with management, supervision, sales, and services auxiliary to management—not with trades, crafts, machine operation, or other manual skills. Under production management and supervision, for example, are such topics as production planning and control, quality control, time and motion study, plant layout and materials handling, product design and development, and industrial supervision. Other topics: business management and organization, personnel administration, labor relations, procurement, traffic management, office techniques.

HOW BIG SHOULD PRESSES GET?

Air Force Pilot Plant studies economic possibilities of giant hydraulic presses, some from Germany. The biggest existing one got away, but presses up to 75,000 tons are under construction



33,000-ton (U. S.) hydraulic forging press constructed in Germany during the war and now owned by the Russians. U. S. engineers are developing one of more than twice this size which they hope to have in operation before 1954

BY CHESTER RICKER,
Detroit Editor

SPAR CAP forgings 33 ft long were designed and produced in a 30,000-ton (metric) hydraulic press in Germany during World War II. Originally produced from extrusions, a 517-lb piece had to be machined down to 176 lb., two-thirds of the original weight being removed as chips.

With a press forging only 22 lb had to be removed in machining, with proportionate savings in man-hours. The Russians got this 30,000-ton press after the war, but others ranging up to 15,000-tons (metric) are now being installed in the Air Force Manufacturing Methods Pilot Plant operated by the Gerity Michigan Corp. at Adrian, Mich.

In addition, 25 new presses ranging up to 75,000 (US) tons will be in operation in a year or so. Six different companies will participate in this future program.

Propellers were forged in the 30,000-ton press. A 12-ft propeller could be produced with both blades and hub integral. They were forged with such precision that only the hub had to be machined. With 2-cavity dies, 700 propellers were produced in an 8-hour shift. Dies ran 100,000 strikes before reworking.

Cost of the dies is not as great as might be expected. Die blocks are hollowed out and inserts fitted into the cavities. This allows reworking for engineering changes or other reasons. Die inserts can be made by conventional methods. Cast steel is used for the main body of the die, often a 0.5% molybdenum alloy. High-quality die steels are normally required for the inserts.

Where finish is not too important, as on a crankcase or a wheel, the dies were of nickel-chrome-moly steel castings made to size and merely sandblasted before being used. These dies were said to run 50 crankcases, nose spinners, or wheels an hour. Most of them had formed more than 100,000 pieces.

Flow of metal is controlled in two ways: by the rate of feed of the ram, which can be varied by the operator, and the shape of the flash groove around the finished piece. By changing the angle of the flash groove surface, the metal may be crowded back into the die at one point and induced to flow outward at another.

Lt. Gen. K. B. Wolfe, deputy chief of staff of the Air Force Materiel Section, lists six advantages of the presses:

1. Parts not requiring the full pressure of the

16,500-ton (U. S.) hydraulic press built and used in Germany during the war and being erected at the pilot plant in Adrian, Mich.

presses can be produced in multiple-cavity dies, thus producing large quantities in an emergency.

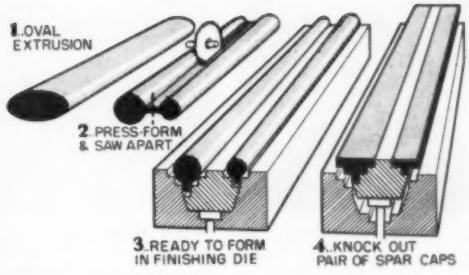
2. It is possible to place dies for several different parts in the press at the same time.

3. Greater strength can be obtained in parts of less weight—important for high-speed aircraft.

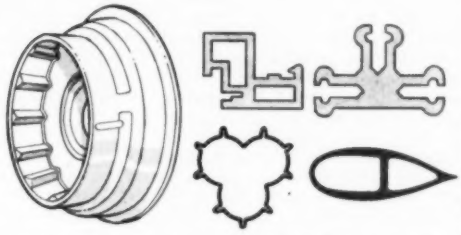
4. Reduction in manhours because there is less machining and assembly time.

5. Reduction in demand for critical materials when using a forging rather than machining from a slab.

6. Fewer general- and special-purpose machine tools are needed, therefore less floor space is required.



Tapered wing-spar-cap for airplane is 19 ft long. It was formerly machined from 207 lb of aluminum alloy, requiring 85 manhours to remove 145 lb of stock. In a forging press only 64 lb are required with 2 lb removed by machining in 5 manhours. An oval extrusion is forged to form two tapered ovals. These are sawed apart and finish forged, two at a time, in 15,000-ton press



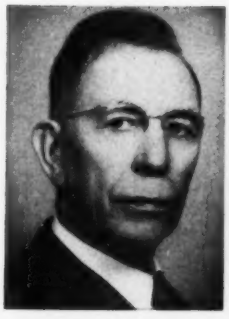
Aircraft wheels of aluminum alloy forged, 50 per hour, in cast nickel-chrome-moly dies that receive no finishing except sandblasting

Extruded shapes typical of those produced at the plant. Lower left section has walls less than ⅛ in. thick and nine folded fins integral with the tube walls

Extrusion-press portion of the plant. Built as a wartime aluminum-extrusion plant, it contained 15 hydraulic extrusion presses ranging from 1650 to 5500 tons capacity

William A. Roberts

H. Edward Neale



George P. Extrom

Ephraim M. Detwiler

Names in the News

William A. Roberts has been elected president of Allis-Chalmers Mfg. Co., Milwaukee, succeeding the late **Walter Geist.** Mr. Roberts was executive vice president in charge of the Tractor Div. **W. C. Johnson,** formerly executive vice president, General Machinery Div., was named executive vice president for the entire company. Other General Machinery Div. changes: **J. L. Singleton,** formerly vice president and director of sales, now vice president in charge of the division; **Fred Mackey,** formerly general works manager, now vice president in charge of manufacturing. Tractor Div. changes: **R. S. Stevenson,** formerly general sales manager, now vice president in charge of the division; **A. W. Van Hercke,** formerly director of engineering, now vice president in charge of engineering; **John Ernst,** formerly general works manager, now vice president in charge of manufacturing.

James A. Scully has been elected board chairman of Scully-Jones & Co., Chicago. **H. Dale Long,** formerly executive vice president, was elected president.

Benjamin E. Feeley has been named manager of production control for Hunt-Spiller Mfg. Corp., Boston. He formerly was industrial engineer and methods analyst with Frederick L. Harrison.

Meritt Myers, formerly production manager of American Stove Company's St. Louis domestic range factory, has been named to the newly created post of director of production planning. **E. Lochmoeller** has been named production manager of the St. Louis Div.

H. Edward Neale has been named assistant sales manager, Bullard Co., Bridgeport, Conn. He joined the firm in 1935 as a student engineer. Since 1949 he has represented the company in the Chicago territory, working out of the offices of Marshall & Huschart Machinery Co. **James L. Shay** succeeds Mr. Neale as representative in the Chicago area, located at Marshall & Huschart offices.

Neal J. Crain has been named director of purchases, United Engineering & Foundry Co., Pittsburgh. **John C. Utzig** was named purchasing agent. The appointments follow the recent death of **G. Walter Sanborn.**

George P. Extrom has been elected treasurer of Gisholt Machine Co., Madison, Wis. He has been with the company for nearly 35 years, and has been acting as assistant secretary for the past 10 years.

Ephraim M. Detwiler has been named manufacturing manager, Lamson Corp., Syracuse, N. Y. He joins Lamson after serving since 1947 as works manager of Worthington Pump & Machinery Company's Holyoke plant.

Thomas O. McMillan, Lebanon, Pa., has been named eastern district representative for Warner Electric Brake & Clutch Co., Beloit, Wis. He will service the entire eastern area excluding part of New Jersey and New York City.

THE DUTCH ORDER of Orange-Nassau was presented in New York Feb. 19 to Alexander S. Keller, former vice president and manager of foreign sales, Pratt & Whitney Div., Niles-Bement-Pond Co. The honor, presented by Netherlands Consul-General Dr. Willem Cnoop Koopmans, (left) was conferred for services rendered to the Netherlands by Mr. Keller when he served as executive officer of the ECA special mission to that country, January 1949 to July 1950. Dr. Herman Baruch (right), who was U. S. ambassador to the Netherlands during Mr. Keller's ECA service there, was among dignitaries present at the ceremonies.

A. R. Wise

H. Thomas Hallowell, Jr.

Everett S. Lee

R. F. Anderson

A. R. Wise, vice president and sales manager of Cleveland Tapping Machine Co., has been named assistant general manager. The firm is a subsidiary of Automatic Steel Products, Inc., Canton, Ohio. Mr. Wise has been associated with Cleveland Tapping for the past five years as vice president, and for 19 years previously was with Spun Steel Corp., a division of Automatic Steel.

R. A. J. Wellington has been named vice president in charge of sales, Precision Metalsmiths, Inc., Cleveland. **Richard W. Devans** was named treasurer and assistant to the president, in addition to his position as vice president in charge of purchasing. Mr. Wellington was general sales manager.

H. Thomas Hallowell, Jr., has been elected president of Standard Pressed Steel Co., Jenkintown, Pa., succeeding **H. T. Hallowell, Sr.,** who becomes chairman. Other changes: **Harold F. Gade,** present treasurer, given the additional title of senior vice president; **J. Whiting Friel,** present sales manager, named vice president in charge of sales; and **William I. Kryder,** named secretary, succeeding **Ralph S. Mast,** retired.

Everett S. Lee has been named editor of the *General Electric Review,* monthly engineering magazine published by GE. He succeeds **Edward C. Sanders,** retired. Mr. Lee formerly was executive engineer of the GE General Engineering Laboratory in Schenectady.

R. F. Anderson has been named vice president and factory manager, Circular Tool Co., Inc., Providence, R. I. He has been vice president and superintendent.

Orren S. Leslie has been named manager of the Beloit, Wis., works of Fairbanks, Morse & Co., Chicago, replacing **Henry M. Haase,** resigned. Mr. Leslie was formerly with the Electro-Motive Div. of General Motors Co., La Grange, Ill., as plant manager.

Frank L. Hooper has been named general sales manager, Kalex Corp., New York. He will very shortly make a trip throughout the United States and Canada appointing dealers for CARY high precision gages.

OBITUARIES

Victor R. Browning, 78, president of Victor R. Browning Co., Inc., Willoughby, Ohio, manufacturers of mill and industrial overhead cranes, died Feb. 16.

Glenn W. Christopher, 64, manager of standard pipe sales for Youngstown Sheet & Tube Co., died Feb. 13.

Walter Geist

Robert C. Stanley, 74, chairman of International Nickel Co. of Canada, Ltd., died Feb. 12. In 1922 he was named president of International Nickel Co., Inc., was named chairman in 1937, and in 1949 relinquished the presidency, remaining as chairman.

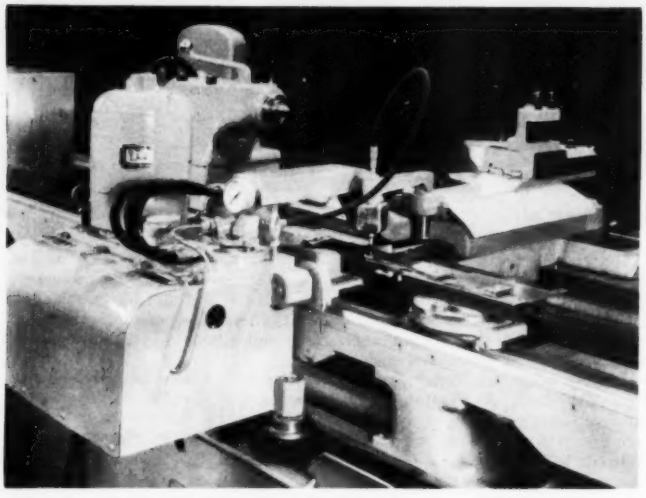
W. L. Iliff, 60, manager of eastern sales, Hyatt Bearings Div., General Motors Corp., Harrison, N. J., died Feb. 3. He had been with Hyatt since 1914.

Walter Geist, 56, president of Allis-Chalmers Mfg. Co., Milwaukee, since 1942, died Jan. 29. He joined Allis-Chalmers in 1909. Later, as an engineer in charge of transmission in the milling dept., he developed the multiple V-belt Texrope drive. In 1933 he was named general sales representative for the General Machinery Div., and in 1939 was elected vice president in that division. In early 1942 he was named executive vice president, and in May of that year was named president.

Edward L. Holljes, 66, general sales manager, William Sellers Co. Div., Consolidated Machine Tool Corp., Rochester, N. Y., died Feb. 3. He joined the Sellers Co. as a machine tool salesman in 1908, was made sales manager in 1927, and general sales manager in 1942. During World War II he served with Navy Bureau of Ships as a civilian adviser on heavy machine tools.

Edward L. Holljes

New Shop Equipment



Power Unit for Tracer Travels With Lathe Carriage

A second design of single-cylinder air-gage tracers for use on 12, 16, and 20 in. Series 60, models M, N and NN Monarch engine lathes has been developed.

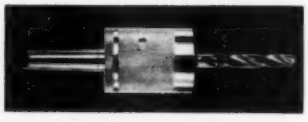
Known as Type C, the model has an inbuilt hydraulic cylinder which is said to give greater compactness and rigidity to the slide mechanism, short hydraulic and air lines, and a power unit which travels with the carriage on a track at the rear of the templet support.

The most important advantage of the traveling power unit is that there is no limit on the length of lathe to which the tracer can be applied. Because the templet support rail is mounted low at the rear of the bed and the tracer supporting arm extends to the rear, beneath the workpiece, work may be loaded and unloaded with the same ease as on a conventional lathe. Switchover to manual operation has been simplified by centralizing the controls in a small three-position lever at the front of the hydraulic slide.

Air-tracer pressure against the templet is only 5 ounces. As a consequence, there is no need to harden it against wear. Either a flat or round pattern may be used. The tracer is available in both swiveling and rigid types. Major advantage of the swiveling slide is in connection with boring operations. Swiveled up to as much as the maximum 90°, boring may be done at the front of the hole and with the spindle rotating in the same direction as during turning operations.

Monarch Machine Tool Co., Sidney, Ohio

(MORE DATA? CIRCLE FYI 31, p. 161)



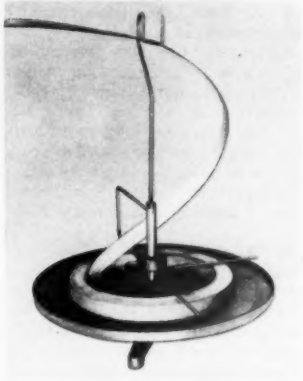
Quick Change of Drills Possible Using Self-Centering Chucks

The Gronkvist self-centering drill chuck is made of Swedish steel, and it is said to be safe and simple to operate. No keys, collets, or wrenches are needed to release the drill from the chuck. Twisting the knurled grip expands the rollers and releases the hold. When inserting the drill the grip is released; both operations can be done while the machine is running. The chuck centers the drill automatically and with increased speed and pressure the grip is tightened.

Capacity ranges from 1/32 to ¾ in. Nos. 1, 2, 3, or 4 Morse-taper shanks are available.

Eric S. Johnson Co., 230 E. Ohio St., Chicago 11, Ill.

(MORE DATA? CIRCLE FYI 32, p. 161)



Clark Horizontal Stock Reel Stops Intermittent Grabbing of Material

One of the big problems of coil-feed presses is the grabbing of material due to tightening of the reel. The Clark reel is said, for the first time, to introduce a natural solution. The material itself is used as the medium to keep the coil slack.

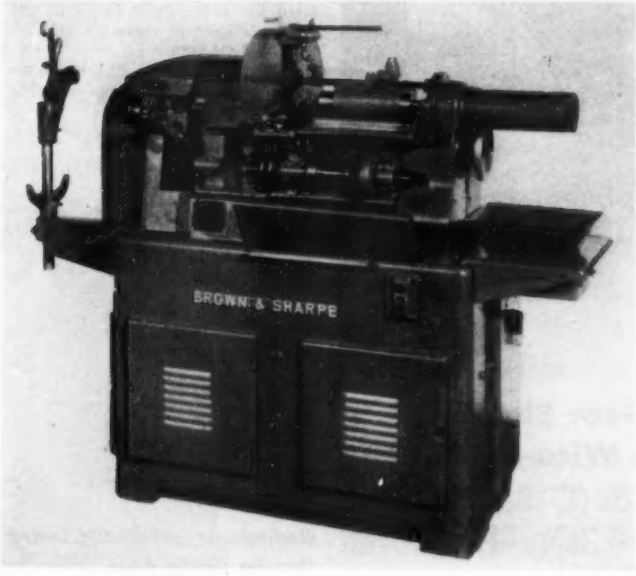
Most other stock reels take the material from the outside of the coil, and due to its inertia, the stock tightens on itself. In this model the opposite is done. The coil is set down on a freely rotating disk, and the material is taken from the center and fed over a support straight to the press. As the stock is taken up, the inside of the coil reduces in diameter, until the natural spring turns the reel.

The reel is primarily intended for use in connection with automatic press feeds. Diameter of turntable is 30 in; maximum dia of coil taken is 28 in.; max. width is 6 in.; and weight of reel is only 40 lb, making it readily portable.

Jaco Devices Inc., 102 High St., Hingham, Mass.

(MORE DATA? CIRCLE FYI 33, p. 161)

Materials and Parts



Pieces Without Any Teat Produced on B & S Cutoff Machine

By the use of an opposed spindle, this Brown & Sharpe machine cuts off a piece without leaving a burr and thus eliminates a second operation. It is said to be particularly useful for the manufacture of roller bearings and similar work.

How it works—The opposed spindle advances to grip the work, a spring collet automatically opening. The piece previously cut off is within the spindle and is pushed to the rear by the new work. The piece farthest to the rear drops into a work pan. After cutoff, the opposed spindle retracts and a swing stop comes down. The stock is advanced to the stop through the work spindle by a spring-actuated finger at the end of the feed tube. Here, too, a spring collet is used, its operation and the stock feed being controlled by a trip dog at the front of the machine.

Two independent cross-slides, front and rear, are mounted in scraped ways cast integral with the bed. Feed of each is controlled by individual cam. They have transverse adjustment, with a dial graduated to 0.001 in. The two toolposts furnished take circular forming tools and provide fine adjustment.

Front and rear stock supports, automatic lubrication, and gear-pump coolant system are other features. Oil is cleaned by strainers in top of the reservoir and around the intake pipe. A pressure-relief valve is provided near the distributor. The geared pump operates whenever the machine-driving motor is running. Guards around the tools confine the coolant within the machine limits. Regular capacity is $\frac{3}{8}$-in. dia. Single movement of mechanism feeds any length to 1 in., greater length to $4\frac{1}{2}$ in. fed by successive movements. 16 spindle speeds are provided, ranging from 454 to 5000 rpm. Drive is by a 2-hp constant-speed motor.

The base unit is of fabricated steel with a large chip space. A chip tray facilitates removal.

Browne & Sharpe Mfg. Co., Providence 1, R. I.

(MORE DATA? CIRCLE FYI 34, p. 161)

...INCLUDING

Automatic unloader for gear shavers unloads the pieces onto a wire-mesh belt.....page 154

Deburrer takes roughness off the edges of an oil-pump rotor automatically .....page 155

Die caster attachments run both zinc and brass, using the same die-locking end .....page 156

Hidden-arc welding process can handle plates in any position from flat to vertical....page 160

Countersinking machine uses a simple advancing mechanism for opposed tools .....page 158

Flexible coupling uses crowned teeth to reduce backlash and increase capacity .....page 164

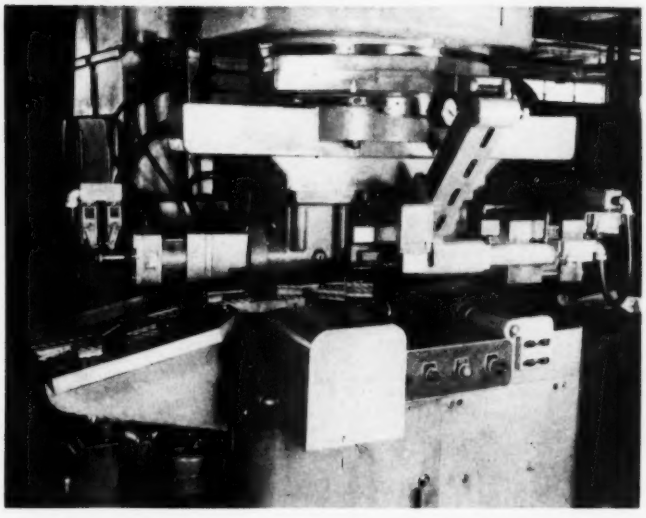
Punch press employs clutch-drive dog to eliminate slot in crankshaft .....page 170

NEW BULLETINS for your Shop Library, including a 40-page booklet on center-type cylindrical grinding.....pages 161 and 162

...and in March 19

Thread grinder uses a longitudinal feed principle for single-thread wheels and a plunge-cut method for multi-thread wheels

Two-point presses have the two main-gear eccentric units designed with very heavy sections.



Automatic Unit For Gear Shavers Unloads Pieces Onto Wire-Mesh Belt

This automatic unloading attachment is claimed to cut cost on gear shavers by reducing fatigue and permitting one operator to run more machines.

The unloader consists of a small wire-mesh belt which travels over two drums. Drive is from a low-horsepower electric motor; slots and one mounting bracket allow adjustment to take up slack. Advantages claimed for the belt are: Since it moves at low speed, cutting fluids are allowed to drain back into the machine before the gear is discharged; the belt has a certain amount of give which prevents damage to the finished gear either from striking a conventional metal chute or another gear. (Metal in the belt is softer than the gears.)

The unit can be attached to any of the company's 870 or 870 A automatic gear finishers in any of several positions. No changes in the machine are necessary except to drill and tap a few holes for mounting brackets and the discharge chute.

Michigan Tool Co., 7171 E. McNichols Road, Detroit, Mich.

(MORE DATA? CIRCLE FYI 35, p. 161)

Mall Portable Impact Wrench Has Hammer Mounted on Bearing

Electric wrench made by Mall applies and removes screws, studs, and nuts, plus runs nuts up to ½-in. bolt size. It will also drill, tap, ream, and extract broken cap screws or studs.

An 11-in., 7-lb unit, it is powered by a reversible, air-cooled motor for operation on 115-volt ac, dc current. A model for 230 volts is available.

The impact hammer is mounted on an antifriction bearing that is claimed to eliminate kick and twist in the hand. Price—$120.00.

Mall Tool Co., 7725 S. Chicago Ave., Chicago 19, Ill.

(MORE DATA? CIRCLE FYI 36, p. 161)

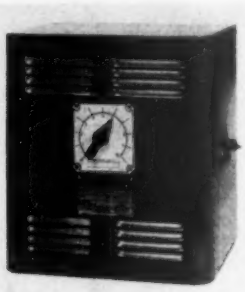
Long Carbide End on Drills Reduces Brazing Failures

Extensive tests on this drill for hardened steels are claimed to show a rise in efficiency and up to 200% greater strength than conventional tipped drills. The tool features a long, solid-carbide end which tends to keep the heat developed in cutting away from the braze. This is said to eliminate failures resulting from tips loosening from the body, particularly in the smaller diameters where it is difficult to put on a good braze.

The drill is stocked in ¼- to 5/16-in. dia's with unlisted sizes available on request.

Super Tool Co., 21650 Hoover Road, Detroit, Mich.

(MORE DATA? CIRCLE FYI 37, p. 161)



Westinghouse Spot-Welding Control Uses No Moving Parts

Air-cooled thyratron tubes and synchronous and non-synchronous control equipment makes and breaks the welding current, with no moving parts. All components are mounted in a side-swinging panel, enclosed in an NEMA Type I enclosure for ease of inspection and maintenance. Knockouts are provided in the enclosure to facilitate making connections.

Synchronous units can be supplied in rms current ratings up to 50 amp at a 10% duty cycle. Non-synchronous units are available in ratings up to 100 amp at 10% duty cycle.

Westinghouse Electric Corp., Box 2099, Pittsburgh 30, Pa.

(MORE DATA? CIRCLE FYI 38, p. 161)

Another Use for Nylon — Diamond Abrasive Belts

These belts are made of solid nylon impregnated with diamond abrasive in grades 1-5 microns to a sieve size of 100. They are for use on carbide dies ranging from ¼- to 9-in. ID.

The resilience of the nylon provides a cushioning effect against shock and prevents the diamond chips from tearing out of their sockets. Tests are claimed to show a life as much as 20 times greater

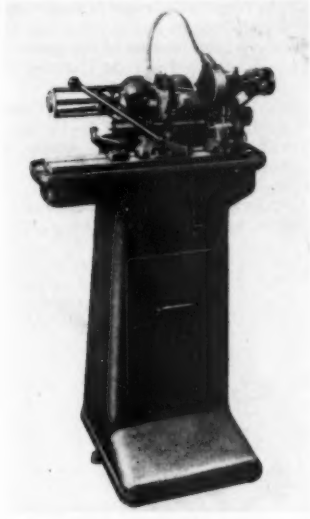
than the ordinary diamond belt.

They are said to be impervious to oil and humidity, and to be cleaned simply by washing in warm water and soap. Color coding of the belts indicates the abrasive size.

They are available in standard lengths of 75 and 104 in. Standard widths in the smaller size are 1/8, 3/16, and 3/8 in., in the longer—3/16, 5/16, and 3/8 in. Special sizes can be furnished to specification.

Hartford Special Machinery Co., Hartford 12, Conn.

(MORE DATA? CIRCLE FYI 39, p. 161)



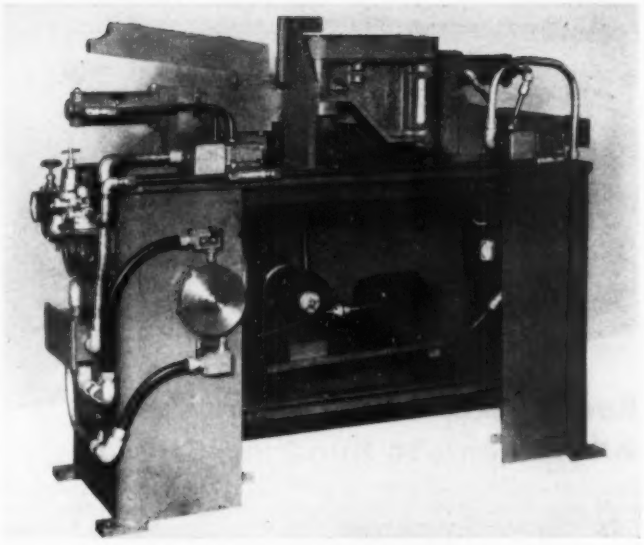
Hauser Pivot Polisher Can Do 600 Pieces Per Hour

It is claimed the Type 241 machine can, in many instances, replace centerless grinding and can be operated by unskilled labor. It will polish pivots straight, taper or radius, and will polish shoulders at the same time with either a right angle or bevel cut. It may be used on mild steel, hardened steel, stainless steel, brass, nickel, bronze, and other materials. Special carbide or ceramic wheels are employed which are claimed to have long life and require little redressing.

Capacity ranges from 0.008-to 0.197-in. diameter. It will polish a maximum length of 0.315 in., and will take a workpiece 5-in. long. Work can be put either in collets or on centers. Price for the Type 241 is $1400.

Hauser Machine Tool Corp., 30 Park Ave., Manhasset, N. Y.

(MORE DATA? CIRCLE FYI 40, p. 161)



Trio Air-Operated Machine Automatically Deburrs Rotors

Deburrer takes roughness off the working edges of an oil-pump rotor after the latter has been ground to exact thickness. The piece is of powdered cast iron, finished to size inside and outside. Because the edges have to be knife sharp, without chamfers, wire brushes that sweep outward are used.

The work rests on rotating wheels which turn it on its axis. Machine is hopper fed, an air cylinder feeding one piece into operating position at a time. Pushing this piece forces out the finished rotor, which rolls down a chute.

Air-operated piston rod with toggle connection opens or closes the arms carrying the wire brushes. Cycle time after initiation is determined by a timing wheel on the left front side of the machine. It operates precision switches that control electro-pneumatic air valves.

Trio Tool Co., Detroit, Mich.

(MORE DATA? CIRCLE FYI 41, p. 161)

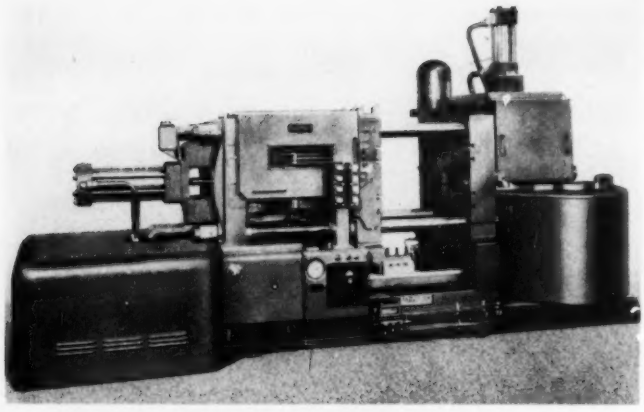
Quenching and Conveying Unit Allows Continuous Heat Treating

This equipment is designed for the continuous heat-treating of individual pieces. The oil in the tank is recirculated and cooled. A metal screen lines the inside of the tank. The metal belt allows the quenched parts to drain as they move up the inclined conveyor which is driven by a self-contained power unit. Cleats or flights can be attached.

The over-all dimensions are: length, 8 ft.; width, 2 ft.; height, 4 ft. Larger quench-conveyors can be built for heavier parts.

The Klaus Machine & Mfg. Co., 4314 E. 49th St., Cleveland, Ohio

(MORE DATA? CIRCLE FYI 42, p. 161)



Reed-Prentice Die Casters Use Attachments to Run Zinc, Brass

Important improvements have been made in the No. 2 and 2G die casters.

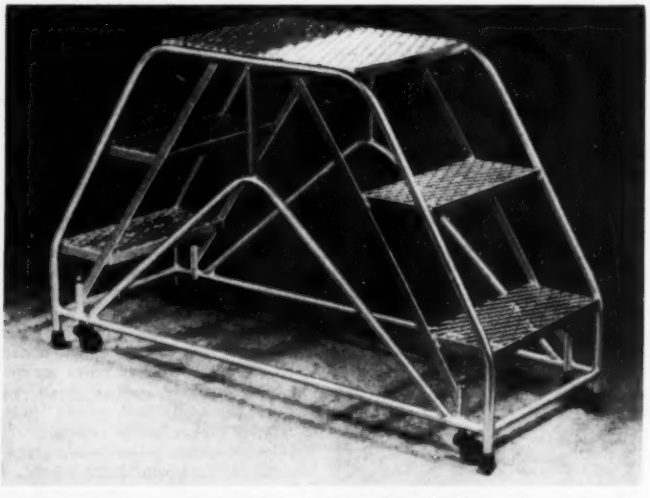
The high-pressure plunger gooseneck attachment of the No. 2 model (for zinc, tin, or lead-base alloys) has been made interchangeable with the high-pressure cold-chamber attachment of the 2G model (for aluminum, magnesium, and brass alloys.) By using the same die-locking end, including the movable and stationary die plates, a more versatile machine is attained.

A 20-hp motor and larger hydraulic pump combine to provide faster cycles. The No. 2 has a maximum shot capacity of 15 lb. (zinc) while the 2G has a maximum of 9 lb (aluminum). A centralized control panel uses improved levers.

Sliding support brackets for the moveable die plate give proper alignment of the die under continuous operation. Two outlets in the stationary plate offer a choice of nozzle location. The melting pot of the No. 2 machine holds 1400 lb of zinc.

Reed-Prentice Corp., Dept. A, Worcester 4, Mass.

(MORE DATA? CIRCLE FYI 43, p. 161)



SAFETY LADDER is made of welded tubular steel. The ladder is 30-in. high, 17½-in. wide, and 48-in. deep. When no one is on, it rolls on swivel casters. The weight of a person, however, causes the spring mounted casters to deflect so that rubber-tipped legs engage the floor and prevent rolling.—*Ballymore Co., 139 Pennsylvania Ave., Wayne, Pa.* (MORE DATA? CIRCLE FYI 44, p. 161)

Oil-Rite Feed Valves Have Reduced Pressure Drop

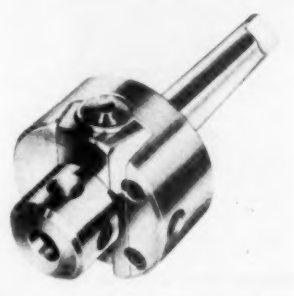
Line of angle-sight feed valves for pressure or gravity oiling systems permits construction of individual systems at low cost. They are claimed to have good free-flow characteristics and allow the flow of oil to be visually checked and closely regulated.

The individual units are equipped with needle-valve control, and regulate flow from full to complete shutoff. Hairline adjustments are made through a friction screw. The friction can be varied by use of a locknut. They can be used singly, Style SFG, or gang mounted, Style SFM. They have larger orifices than previous models and a reduction in pressure drop because of the absence of restrictions. The sight chamber is vented to prevent air binding.

The valves are furnished in three body sizes, with inlet of ⅜- to ¼-in. female pipe thread, and outlets of ⅛- to ½-in. female pipe threads or compression fittings.

Oil-Rite Corp., Milwaukee 15, Wis.

(MORE DATA? CIRCLE FYI 45, p. 161)



Flynn Offset Boring Heads Have Round Extension Nose

Five heads have been added to a line made by Flynn, bringing the total to 16. Known as the 40 Series, they are of light-weight design. The smallest has a 2¾-in. dia, ½-in. bar capacity, and weighs 3 lb. The largest has a 6½-in. dia, 1½-in. bar capacity, and weighs 24 lb. Bar offset of the series ranges from ⅝ to 1½ in.

The heads have a smooth, round contour and a micrometer offset adjustment. All are machined from solid stock and ground after hardening. The extension nose on the new models is round to provide maximum safety for operators. The tool may be inserted in the head either vertically or horizontally.

Flynn Mfg. Co., 133 Flowerdale, Ferndale, Mich.

(MORE DATA? CIRCLE FYI 46, p. 161)

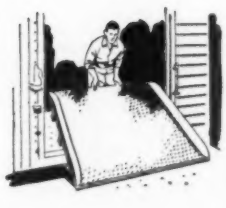
ANYBODY
can weld it!

MAGNESIUM

That's right! If you can weld any metal, you can weld magnesium. Nearly all of the common welding techniques can be employed. Inert-gas shielded arc welding, gas welding, and electric resistance welding are all being used successfully on magnesium.

Most forms of magnesium are weldable. While joint strengths will vary with different alloys, typical properties of welded butt joints show tensile strengths up to 42,000 psi. and elongation up to 12%. Also, magnesium welds are comprised of dense metal and are substantially free of microporosity.

The combination of relatively high weld strength and minimum specific gravity found in magnesium generally permits designing welded magnesium structures that are lighter, stronger, and more rigid than is possible in other light metals. For more information call your nearest Dow sales office or write direct to Dept. MG-43.

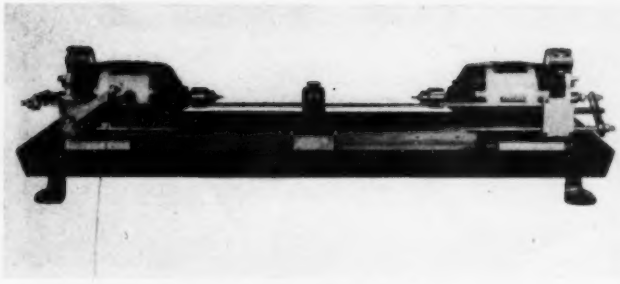


***DOCKBOARDS** formed from 5/8" magnesium plate are arc welded in production with a single pass.*

Magnesium Division, Dept. MG-43

THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN

New York • Boston • Philadelphia • Washington • Atlanta
Cleveland • Detroit • Chicago • St. Louis • Houston
San Francisco • Los Angeles • Seattle
Dow Chemical of Canada, Limited, Toronto, Canada



Improved Tool Controls for Black Countersinking Machine

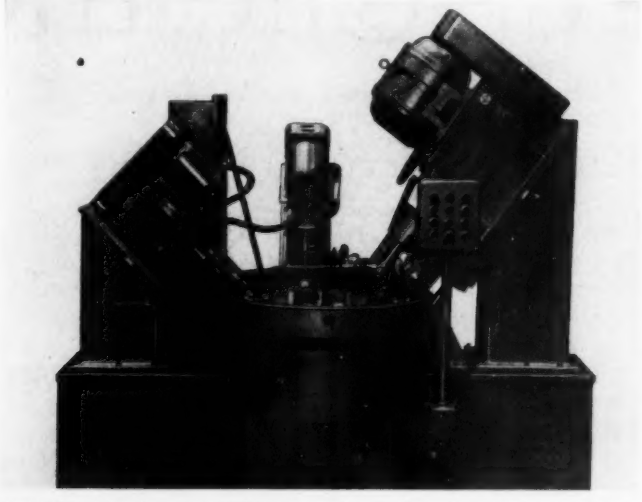
The latest model of this machine is equipped with a tool-advancing mechanism which is simple in design and operation. When power is supplied to the two traversing shaft motors, the rotors automatically position themselves in the center of the magnetic fields in the stators and remain there. When the work is in place, pressure on a foot treadle is transmitted through a cable and arm to a pinion which produces opposite movements of the racks. Each rack carries an arm fitted with an adjustable stud which moves with the rack, pressing the motor shaft and tool forward. These arms are adjustable by setscrews to any position, while an adjustable stop on the lower rack limits the travel of the motor shafts.

No holding fixtures are required when both tools are performing similar operations. This is due to the motors rotating contra-directional, thereby neutralizing torque on the workpiece.

Maximum distance between chucks is 20 in. and max. cutting stroke for each tool is 1 in. Cycling rate is 100 per min. on short strokes. Other uses which the machine can be put to beside countersinking are chamfering, deburring and drilling.

Black Drill Co., 1400 E. 222 St., Cleveland 17, Ohio

(MORE DATA? CIRCLE FYI 47, p. 161)



DRILLING and milling are performed on this machine through the use of three cam feed units. The fabricated steel base contains a 24-in. automatic index table having four stations. The work is a connecting rod and cap on which a 3/16 and a 1/16 in. hole are drilled, and two slots are milled. The end and bottom of both parts are locked simultaneously by a cam clamp.—*The Avery Drilling Machine Co. Inc., Cincinnati 1, Ohio*

(MORE DATA? CIRCLE FYI 48, p. 161)

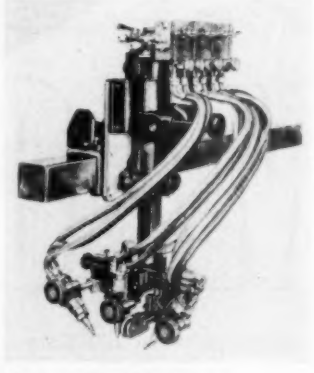
One-Piece Shackle Pin Uses Disappearing Balls

Retaining pin acts like a bolt except that no separate items such as cotter keys or nuts are needed. It can be used for shackle purposes, or as tie-down fastenings, and is capable of taking high shear and axial loads.

A mechanical locking arrangement is employed. Inside the pin is a spring-loaded steel spindle operated by pushing or pulling the button head. The large diameter of the spindle bears against steel balls, holding these out so that they project against the surface and thereby act as a lock. When the spindle is moved to the small diameter, the balls recede below the surface, allowing the pin to be removed.

Aviation Development, Inc., 2940 N. Hollywood Way, Burbank, Calif.

(MORE DATA? CIRCLE FYI 49, p. 161)



Single or Double Bevels Put on Plate Edges

An ability to cut a single- or double-bevel accurately, with or without a land, is claimed for this unit. It employs a spring-balance, free-floating carriage and casterwheel assembly to permit bevel cutting over plate undulations while maintaining a constant tip-to-work distance. The unit will mount on any gas cutting machine equipped with a 3-in.-square torch bar.

Torches may be individually positioned vertically or laterally without changing the bevel angle. Fuel and preheat pressures are initially set with individual valves, and once set, the master valve controls turning on gas supply without disturbing settings of the individual valves.

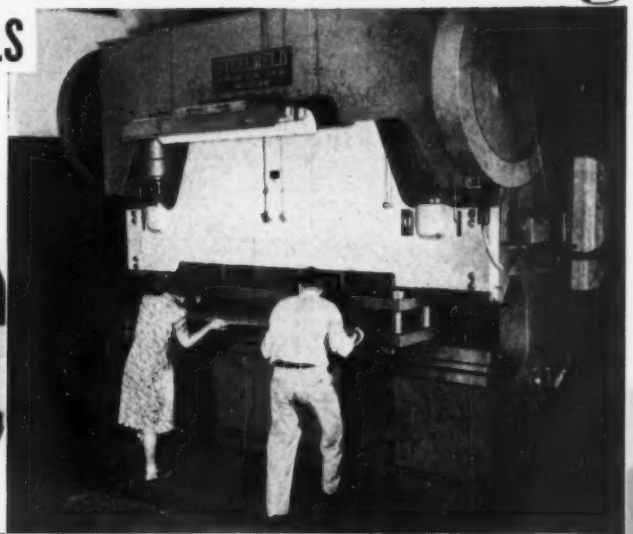
Air Reduction, 60 E. 42nd St., New York 17, N. Y.

(MORE DATA? CIRCLE FYI 50, p. 161)

blanking and embossing

ACOUSTIMETAL PANELS

4800 panels for 12" x 24" sound-deadening cells are blanked out and embossed per 8-hour day with these dies.



This rugged smooth-working press performs nearly every kind of metal forming operation at Dussing & Hunt, Inc.—bending, forming, flanging, blanking, embossing, and punching. It is easy to change the dies from one job to another or repeat previous runs of work to close tolerances.

Of the many types of work performed on the Model J4½-10 Steelweld Press at Dussing & Hunt, Inc., Buffalo, N. Y., the blanking and embossing of panels for Acoustimetal sound-deadening cells is one of the most interesting.

Large sheets of 26 gauge perforated metal are fed into the dies attached to the bed and ram, by the man operator and his woman assistant. At each stroke of the ram three panels are blanked out and embossed. Six panels for 12" x 24" cells are made from each sheet. 100 sheets are passed through the press per hour. Thus, 600 panels are turned out per hour, or 4800 per eight-hour day.

A large variety of metal parts are produced on the Steelweld. Included are 22-gauge stainless steel tops for deep-freeze cabinets with neatly rounded flanges, fire-proof doors and all-steel industrial doors of 10 to 14 gauge, 14-gauge pressed steel frames, heavy steel channels and many other parts.

The press was installed in 1942 and has been kept going continuously. The Plant Manager of this rapid-growing concern says, "It has proved very satisfactory and efficient."

Acoustimetal panels are produced with such speed that one man is kept busy at the rear of the press removing the scrap and a woman is fully occupied stacking the panels as they roll down the conveyor from the press bed.

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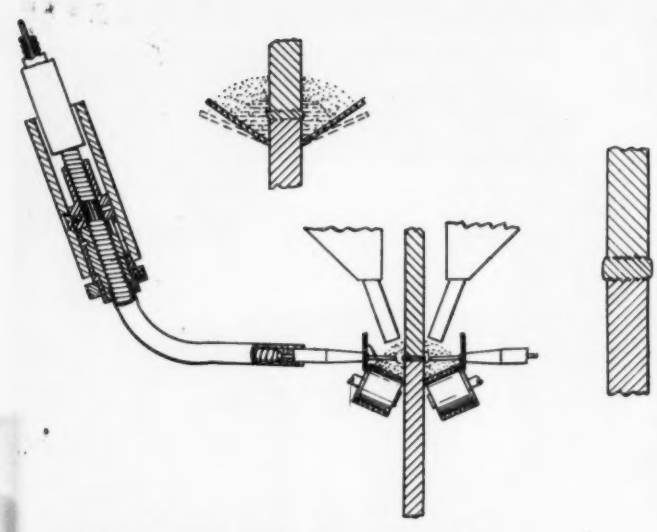
STEELWELD

BENDING PRESSES

BRAKING • FORMING • BLANKING • DRAWING • CORRUGATING • PUNCHING



Lincoln 3 O'Clock Welding Process Cuts Arc Time 50%

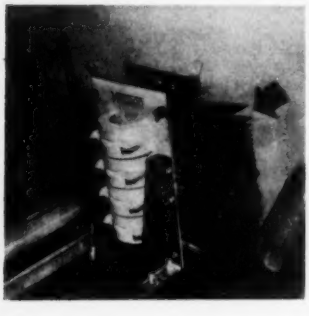
Automatic hidden-arc welding has been limited heretofore to downhand welding. A process developed by Lincoln consists of new methods, procedures and equipment wherein the previous difficulties of directing the electrode and retaining flux and molten metal in a joint not lying flat are overcome. With this process, the plate being welded may be positioned anywhere from flat to vertical, the joint being horizontal.

Because joints can be positioned horizontally, welds from both sides of the joint can be made simultaneously. This reduces actual arc time on a given joint by about 50% and results in lower direct-labor costs. Positioning each piece for downhand welding is eliminated, thus reducing handling and setup time.

Savings are also made because of the smaller sizes of electrode wire used. For example, where on a downhand application a 7/32-in.-dia electrode would be used, in a 3 o'clock position, a 3/32- or ⅛-in.-dia electrode is used. Advantages claimed: lower currents are used; less electrode is required; smaller quantities of flux are consumed; welds of reduced cross-sectional area are made, thus wasting less metal in unnecessary build-up.

The joint is stationary as two electrodes are moved along opposite sides of the work. Flux is carried on a moving belt so that it is stationary in relation to the work.

The Lincoln Electric Co., Cleveland 1, Ohio
(MORE DATA? CIRCLE FYI 51, p. 161)



Magnetic Sheet Separator Speeds Press Handling

Difficulty in separating sheets of steel for feeding into stamping presses and press brakes is claimed to be eliminated by this permanent-magnet unit.

The construction consists of Alnico magnets, a stainless-steel mounting bracket, and a stainless wearing plate welded into a single unit. Known as the Sheet Floater, a magnetic field is induced in the sheets in such a way that they repel each other causing the ends to float or fan out with air space between them. Because of this separation, the top sheet can easily be grasped by the worker and fed into the press.

The number and size of units required and their positioning depends upon the size, weight, and shape of the sheets. Blanks and irregular shapes can also be separated.

Verson Allsteel Press Co., 9316 S. Kenwood Ave., Chicago 19, Ill.
(MORE DATA? CIRCLE FYI 52, p. 161)

Rivett Hydraulic Unloading Valve Operates by Pilot Pressure

The Model 8826 Valve is used in oil-hydraulic circuits to unload one part of the circuit at no back pressure to the tank. The valve is operated by pilot pressure from some other part of the circuit, free flow continuing to the tank as long as the pilot pressure is higher than the setting of the valve.

A balanced-piston design is used for accurate fit to the valve bore. The units are available in sizes ¼ to 1½ in., and two pressure ranges of 50 to 150 psi, and 500 to 1500 psi, adjustable from minimum to maximum in both ranges.

Rivett Lathe and Grinder, Inc., Brighton, 35, Boston, Mass.
(MORE DATA? CIRCLE FYI 53, p. 161)

Vibration isolator use non-linear springs to give a constant resonant frequency throughout a 2-to-1 load range. Load ratings of bases using these units are 0.1 to 3.0 lb per mount. Known as the Series 6465, the mounts have aluminum shells, steel springs, and rubber air chamber and snubbers. They are 1-in in diameter and 1 1/32-in. high under max. rated load.

The Barry Corp., 703 Pleasant St., Watertown 72, Mass.
(MORE DATA? CIRCLE FYI 54, p. 161)

FYI

FOR YOUR INFORMATION

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NEW BULLETINS

MACHINES AND ATTACHMENTS

1 CYLINDRICAL GRINDING — *The Carborundum Co., Niagara Falls, N.Y.* 40-page manual gives much information on the factors affecting operation of center-type grinders. Subjects covered include: coolants, the machines used, proper work setup, metallurgical characteristics of the work, wheels and dressers, etc.

2 BROACHING—*National Broach and Machine Co., Detroit 18, Mich.* 8-page bulletin shows how broaches are made, and their heat-treatment and design. Broaching fixtures are also covered.

3 SURFACE GRINDER—*Gardner Machine Co., Beloit, Wis.* 8-page catalog illustrates and describes the new, model 2V-18 double-disk grinder. It grinds two flat surfaces simultaneously.

4 SQUARING SHEARS—*Columbia Machinery and Engineering Corp., Hamilton, Ohio.* 8-page bulletin 901 describes a new power-shear line, recently improved and enlarged to include models for shearing mild-steel plate from 3/16- to 1¼-in. thick.

5 CUTTER GRINDER—*Pratt & Whitney, Div. Niles-Bement-Pond Co., W. Hartford 1, Conn.* 8-page bulletin covers a grinder for getting proper radii, angles, and tangents on cutters and end mills. All cutters are held by their shanks, a practice which is said to assure concentricity of the flutes.

6 STRAIGHTENERS — *Mackintosh-Hemphill Co., Pittsburgh, Pa.* 4-page catalog illustrates and describes 11 models of rotary straighteners which remove the bends, bows, waves, and kinks from tubing or pipe of any metal.

TOOLS AND ACCESSORIES

7 COUNTERBORES—*Scully-Jones and Co., Chicago 8, Ill.* 8-page bulletin 5-50 describes and gives complete specifications

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FREE advice on metalworking problems

on counterbores, countersinks, core drills, and counterbore pilots and drivers.

8 CONTOUR PROJECTOR — *Eastman Kodak Co., Rochester 4, N. Y.* 8-page booklet on the Model 2 projector explains what it is, how it can be used, and gives specifications on optics and accessories.

9 CENTERS — *The Ready Tool Co., Bridgeport 5, Conn.* 4-page bulletin gives the principal features and specifications of a center with New Departure duplex ball bearings.

10 PORTABLE TOOLS — *Cummins Portable Tools, Div. Cummins-Chicago Corp., Chicago 40, Ill.* 4-page catalog on drills, power saws, and disk sanders gives features and specifications.

11 STUD DRIVERS—*Heli-Coil Corp., Long Island City, N. Y.* 4-page bulletin on Aero-Thread stud drives covers the uses and operation of both hand and power models.

12 GRINDING WHEELS — *Bay State Abrasive Products Co., Westboro, Mass.* 4-page bulletin on Koolpore abrasive products illustrates and describes the various wheels and segments and gives cutter recommendations.

13 FLOATING HOLDERS — *Scully-Jones and Co., Chicago 8, Ill.* 4-page bulletin 8-50 covers holders with unrestricted parallel or angular float. Includes specifications.

HEAT-TREATING AND WELDING

14 INDUCTION HEATING—*Sherman Industrial Electronics Co., Belleville, N. J.* 5-page catalog covers the Megacycle line of heaters. Includes photos of automatic soldering and brazing setups, specifications, and a data sheet which shows capacity of heaters.

15 SPATTER PROOFING — *G. W. Smith & Sons, Inc., Dayton 3, Ohio.* 4-page bulletin on Protect-O-Metal weld-spatter preventives and metal-protection compounds gives full details on compositions and applications.

PLANT-SERVICE EQUIPMENT

16 HOISTING EQUIP—*David Round & Son, Cleveland 5, Ohio.* 92-page catalog on chain hoists, trolleys, cranes, sheaves, chain, winches, etc. contains illustrations and descriptive matter on each product, specifications, and prices.

17 CONVEYORS — *Logan Co., Louisville, Ky.* 36-page catalog shows shop installations of roller, belt, apron, and special conveyors and gives case histories of money saved. 4 pages of sketches show some typical solutions to handling problems.

18 DUST COLLECTORS—*Aget-Detroit Co., Ann Arbor, Mich.* 38-page catalog illustrates and describes a line of Dustkop collectors. Subjects covered include grinding and buffing dust, lubricant mist, and chip control.

19 FLOORING—*Dravo Corp., Pittsburgh 22, Pa.* 16-page catalog describes various types of Tri-Lok open steel flooring and safety treads. Includes specifications, and safeload tables.

20 CRANE SCALE—*Hydroweg Scales, Inc., Detroit 19, Mich.* 6-page catalog describes the operation and applications of the company's new hydraulic crane scale.

PARTS AND MATERIALS

21 CYLINDERS — *Power Plus Products Co., Detroit 7, Mich.* 40-page manual on air and hydraulic cylinders for services requiring line pressures up to 750 psi. All cylinders are drawn and complete dimensions and specifications given.

22 HYDRAULIC FLUIDS — *Union Carbide and Carbon Corp., New York 17, N. Y.* 12-page booklet gives physical properties and advantages of Ucon fluids. One property is the oils are fire-resistant.

23 RUBBER COMPOUNDS—*The Stalwart Rubber Co., Bedford, Ohio.* 16-page catalog on 30 compounds that feature resistance to abrasion, chemicals, temp. extremes, oils, and weathering.

24 FERROUS CASTINGS — *Belle City Malleable Iron Co., Racine Steel Castings Co., Racine, Wis.* 4-page reference sheet compares different types of gray castings as to physical properties, advantages, and applications.

25 BEARING CARE—*The Anti-Friction Bearing Distributors Assn., Cleveland 15, Ohio.* 4-page bulletin gives the symptoms, cause, and correction for 10 types of ball bearing failure, plus other information.

26 AMMETERS — *Columbia Electric Mfg. Co., Cleveland 14, Ohio.* 8-page folder covers tong ammeters that can be used to measure current in both ac and dc lines.

27 COMPRESSOR DRIVES — *Electric Machinery Mfg. Co., Minneapolis 13, Minn.* 24-page bulletin contains tables and charts for matching motor characteristics to air-compressor requirements. Applications and motors are also discussed.

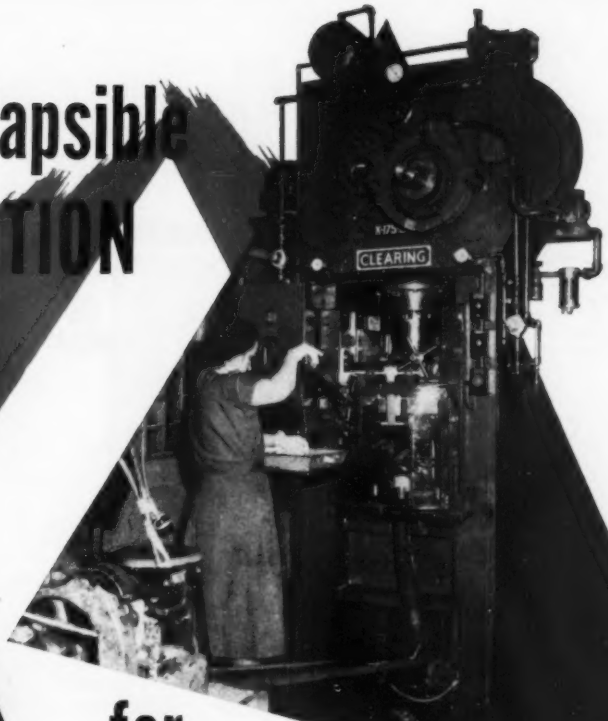
MISCELLANEOUS

28 SELLING TO THE GOVT. — *Research Institute of America, Inc., New York, N. Y.* 34-page directory, "Selling to the Armed Forces," gives an alphabetical listing of the major articles being bought by the military and the offices that buy them.

29 COMPANY EXPLAINS — *Armco Steel Corp., Middletown, Ohio.* 22-page booklet of ads reproduced from the company's magazine show how the free enterprise system works.

30 TURBOSUPERCHARGERS — *General Electric Co., Schenectady 5, N. Y.* 8-page bulletin illustrates and describes the GEA-5537 supercharger.

Non-Collapsible PRODUCTION



for Collapsible Tubes

With integrated production, where failure of one machine can stop a whole line, Peerless Tube Company chose Clearing presses for the extrusion operation which is the first stage in their lines. In the Bloomfield, New Jersey, plant, a group of 75-ton Clearings is now at work operating at 60 strokes per minute.

Clearing presses have demonstrated convincingly that they are dependable and can aid in maintaining production schedules at Peerless and many other companies throughout the world. We can help you with your mass production problems. Write us for details.

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THE WAY TO EFFICIENT MASS PRODUCTION

CMC CLEARING

Automatic Cycling Used in Air-Operated Zinc Die Caster

An adjustable timing dwell on the opening and closing of the toggle and injection of the molten metal are also used in this machine. Castings up to 1 lb. can be produced, utilizing die blocks from 1½ in. thickness by 8x10 in. with an allowable increase in die thickness up to 3 in. for each half.

The machine is equipped with a 200-lb pot and is capable of a free cycling speed beyond 1000 shots per hour. It was primarily designed for single-cavity dies because of the high production speed.

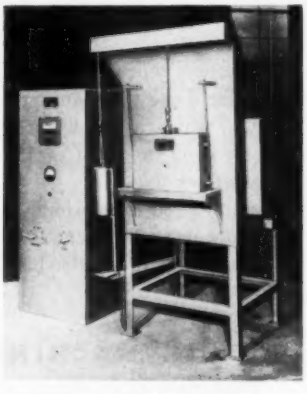
ABC Die Casting Co., 339 W. 112th Place, Chicago 28, Ill.
(MORE DATA? CIRCLE FYI 62, p. 161)

De-Sta-Co Plunger Toggle Clamp Delivers Up to 4000-lb Pressure

Known as the No. 650, this clamp is said to position and hold the work firmly in place. A toggle locking action produces pressures up to 4000 lb. The base and plunger housing is a one-piece high-alloy heat-treated steel casting, as is the handle; both castings are finished for rust resistance and non-slip grip.

The plunger travels 3 in., and the end is tapped for a ⅝-in. dia adjustment bolt. A self-feeding lubricator pad on top of the housing provides lubrication.

Detroit Stamping Co., 343 Midland Ave., Detroit 3, Mich.
(MORE DATA? CIRCLE FYI 61, p. 161)

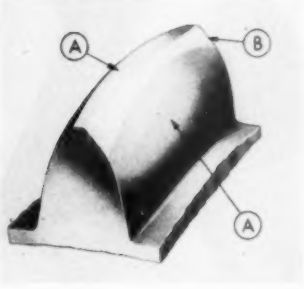


Pereco Heat-Treating Furnaces Have Separate Control Panel

These furnaces are said to do the work of multiple equipment over the full range of heat-treating temperatures. Known as the FG Series, they are equipped with Globar heating elements, and are designed for heavy and continuous duty at all heat levels up to 2500 F, with higher temperatures available for short or intermittent runs.

Each of the furnaces has a separate control-panel unit, complete with indicating controller, transformer, current-input meter with push-button reading, and magnetic contactor. A wide choice of standard makes or types of control are available. The voltage-regulating transformer with 36 taps on multiple dead-front switches maintains a constant rate of heating. It makes available a wide range of voltage turn-down for low-temperature work. Maximum connected load of the furnaces range from 9 to 50 kw.

Pereny Equipment Co., 893 Chambers Road, Columbus 12, Ohio
(MORE DATA? CIRCLE FYI 63, p. 161)



Misalignment Compensated By Crown Teeth in Coupling

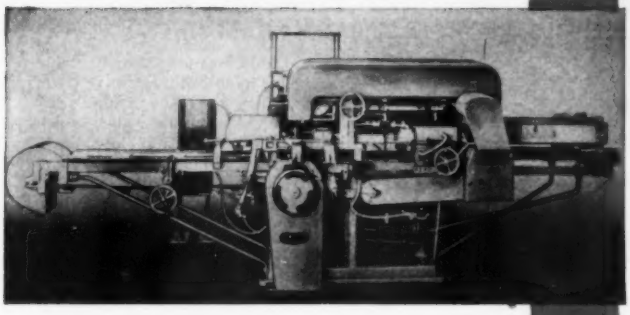
Using a special tooth design is said to increase load capacity and reduce backlash in Amerigear flexible couplings. External teeth of the coupling hub gears are crowned at contacting surfaces, indicated by A in the diagram, and are chamfered at B. This reduces the clearances required and consequent backlash. It is also claimed to prevent high stress at the tooth-end, the weakest part of the tooth.

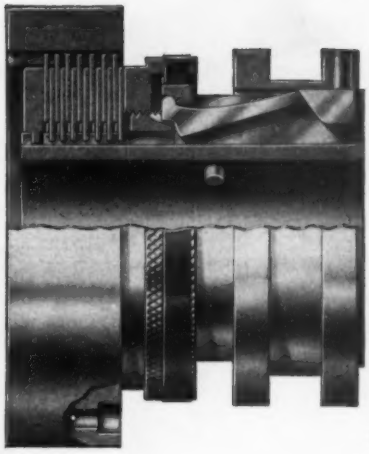
The chamfer prevents the edge of the hub teeth from striking filets at the root of the internal teeth or splines of the sleeve, so low clearance can be maintained while there is full contact along the side areas of the teeth. Other improvements claimed include better wear characteristics and greater misalignment capacity. The coupling is furnished in horsepower capacities from 2.1 hp to 4100 hp per 100 rpm, with corresponding maximum shaft speeds from 12,000 to 1250 rpm.

American Flexible Coupling Co., Erie, Pa.
(MORE DATA? CIRCLE FYI 64, p. 161)

MAXITORQ

Keeps Good Company





. . . in the PACKAGING FIELD

The MAXITORQ floating disc CLUTCH takes care of power transmission in this Model FF packaging machine, used in freezer plants to overwrap frozen food packages.

The Package Machinery Company, Springfield, Mass., one of the largest manufacturers of packaging machinery in the world, builds approximately 100 different models of machines. Their engineers say, "We have been so well satisfied with the Maxitorq Clutch that we have adopted it as standard on practically all machines we build that require a clutch type of drive."

This specific Maxitorq is the NO. 23, single dry type, 1 H.P. at 100 r.p.m., 4-1/32" long, 3-15/16" dia. There are 8 standard capacities, 1/4 to 15 H.P. single or double, wet or dry. Separator springs keep discs "floating" in neutral . . . prevent drag, abrasion, heating. Assembly, adjustment, take-apart are manual . . . no tools required. Disengagement is instant and complete.

Within its capacity, the Maxitorq Clutch serves many applications for machine tools, industrial products, mowers, textile, printing, mining, lumbering, packaging and a host of other machines. Ask for our engineering recommendations . . . join "Maxitorq's good companies."

Send for Catalog No. AM3

9CJ81

THE CARLYLE JOHNSON MACHINE COMPANY
MANCHESTER • CONNECTICUT

Motor Enclosed in Cable Drum On Cleveland Electric Hoists

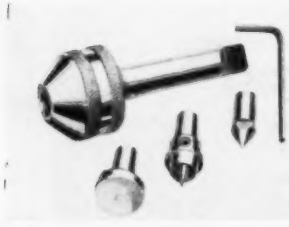
A feature of these Bob-Cat hoists is the total enclosure of the motor within the cable drum. This is said to reduce the overall dimensions and afford substantial weight savings. Due to the enclosed design, the motors are protected against moisture, splashing liquids, weather, dust, and corrosive atmospheres.

Gear reduction is by means of a double internal epicyclic gear train that incorporates two Weston-type load brakes. The motor brake is of the equalizing solenoid type connected to an up-limit cutoff switch.

The load hook oscillates on ball bearings and swivels on roller bearings. It is suspended on a 5/16-in. preformed plow-steel cable. The hook can be replaced without dismantling any part of the hoist.

Designed for operation on 220, 380, 440, or 550 volt, 3-phase, 60-cycle current, the hoists are available with either pendant rope control or push-button control on pendant cable. The latter style has a strain relief cable from the hoist to the control unit.

Cleveland Chain & Mfg. Co., Broadway and Henry Sts., Cleveland 5, Ohio
(MORE DATA? CIRCLE FYI 65, p. 161)



Delta Ball Bearing Center Can Take Heavy Loads

Freedom from chatter, and a strong, simple construction are claimed for this center. It has a double row of sealed, lubricated-for-life ball bearings to take heavy radial and thrust loads. It is claimed to run true, because the center socket is drilled and machined after assembly.

The unit may be used on a lathe, grinder, screw machine, gear hobber, and similar machines. It is supplied with three replaceable centers and a wrench. The shank has a No. 2 Morse Taper.

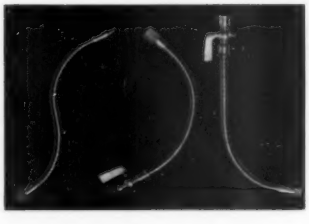
Delta Power Tool Div., Rockwell Mfg. Co., Milwaukee 1, Wis.
(MORE DATA? CIRCLE FYI 67, p. 161)

OTC Adjustable Wrenches Have Tapered Jaws

Four thin, light-weight, adjustable wrenches have been made by Owatonna. They are made of high-alloy steel and have tapered jaws which permit ready access into close places.

The wrenches are heat-treated and have a chrome-plated finish. The 6 to 12 in. wrenches have capacities ranging from ¾ to 1 5/16 in.

Owatonna Tool Co., 383 North Cedar St., Owatonna, Minn.
(MORE DATA? CIRCLE FYI 68, p. 161)

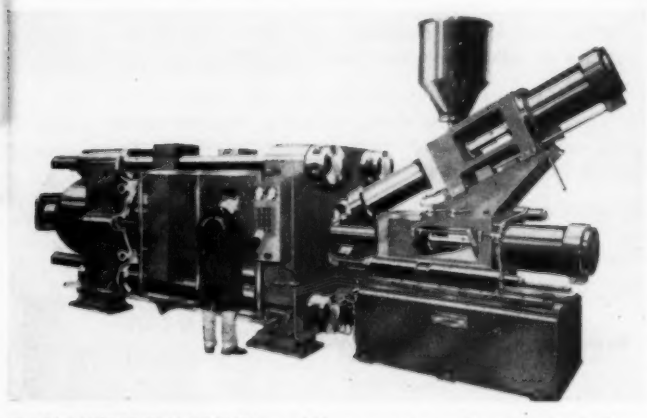


Fauver Coolant Spouts Stay In Place

A line of spouts, known as Bullseye, are claimed to stay in place regardless of machine vibration or volume of coolant flow. They feature: elimination of all leaky pipe joints and swivels; unrestricted flow of coolant; ease of switching from one machine to the other; and long life.

They are fitted with nozzles, male or female couplings, stop cocks, or unions. The combinations available are: Male x Female, Male x Male, Male x Nozzle, Female x Female, Female x Nozzle. Special combinations and mill lengths with or without fittings are also available. Sizes in standard diameters are: ⅛, ¼, ⅜, ½, and ¾ in.

J. N. Fauver Co. Inc., 49 West Hancock, Detroit 1, Mich.
(MORE DATA? CIRCLE FYI 69, p. 161)



PLASTIC-MOLDING MACHINE has a 300-oz. capacity, and is said to be the largest injection molder ever built. Fully hydraulic, it is equipped with manual as well as automatic single-cycle control and adjustable speed control of the injection ram. Individual adjustable control of injection and clamping pressures is also provided. Clamping pressure is 1500 tons, and the platen takes a 4x6 ft. mold. *Watson-Stillman Co., Roselle, N. J.* (MORE DATA? CIRCLE FYI 66, p. 161)

SUNTAC ENDS LUBRICATION HEADACHE

Keeps Plant in Full Operation and Reduces Oil Consumption 50%

Cold-rolling threads on cold-headed bolts is a tough operation, and a mighty big financial headache, if the thread-roller does not receive proper lubrication.

Such a condition developed in the plant of a well-known manufacturer of screw machine products. Oil ran out of bearings and would not adhere to the guides for the reciprocating die holder. On several occasions the main bearings overheated and seized up. In each instance four days' downtime resulted, costing a large amount for labor and 30 percent in bolt production. Furthermore, the oil loss became so excessive that maintenance crews actually had to put in extra work to keep floors clean and safe.

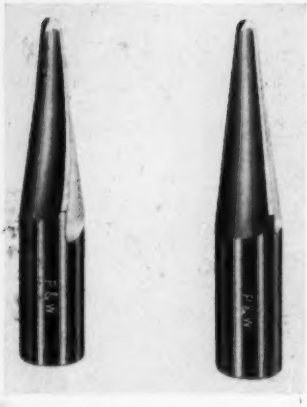
In his search for a solution to the problem, this manufacturer called in a Sun representative, who induced him to try Suntac Oil. In the 18 months which have elapsed, there have been no production losses attributable to inadequate lubrication, downtime has been eliminated, and cleanups have been reduced to a routine minimum. The consumption of oil has been cut in half. Savings on oil and maintenance have amounted to more than $3,000.

Suntac Oils are recommended for general lubrication in all machinery where retention of oil in bearings is a problem. These "Job Proved" products cling to the parts to be lubricated. For further information, call or write your nearest Sun Office.

SUN OIL COMPANY • *Philadelphia 3, Pa.*
In Canada: Sun Oil Company, Ltd.
Toronto and Montreal

SUN PETROLEUM PRODUCTS
"JOB PROVED" IN EVERY INDUSTRY

SUNOCO



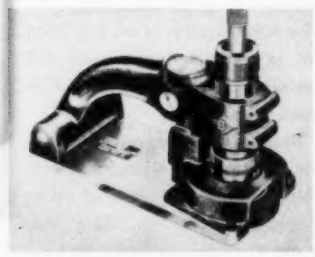
P&W Die-Sinking Cutters Have Finish-Ground Ball Nose

These cutters are supplied ready to use, with the ball nose finish ground to cut to dead center, so that no preliminary hand grinding is necessary.

Two styles of fluting are available: straight, for easy hand sharpening; and spiral, for users who prefer helical cutting characteristics and have mechanical grinding equipment.

The cutters have a 7° taper and are furnished with right-hand cut and straight shanks. The ball nose has a radius equal to one-half the diameter of the small end, and blends smoothly into the taper.

Pratt & Whitney Div., Niles-Bement-Pond Co., West Hartford 1, Conn.
(MORE DATA? CIRCLE FYI 70, p. 161)



Reid Portable Surfacer Eliminates Hand Scraping

It is claimed that this unit not only does work equivalent to the best hand scraping, but does so in a fraction of the time. It is fitted with standard 3-in. cup wheels working at 6000 rpm.

A micrometer adjustment gives positive control of the depth of cut, a maximum of 0.005 in. being obtainable. The workhead is spring loaded, insuring that the grinding wheel is clear of the work when the tool is not in operation. The motor is connected to the surfacer by a flexible power shaft, and is usually suspended about 4 ft. above the unit. An angular wheel setting gives varying cut for removing high spots or fine finishing. It is adjustable from 0 to 2. A hardened sole plate provides a permanent, true, hard-wearing surface.

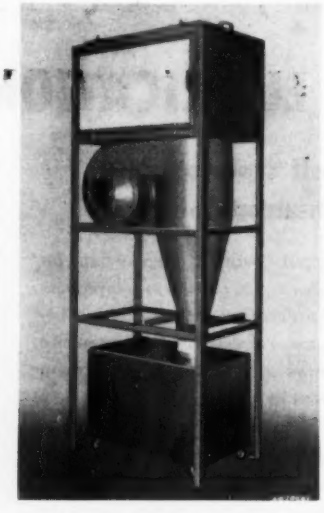
Reid Bros. Co. Inc., Beverly, Mass.
(MORE DATA? CIRCLE FYI 71, p. 161)

Experimental-Layout Kit Uses ¼-in. Scale Model

A kit containing 200 pieces is said to demonstrate the values of three-dimensional planning. It includes machines, benches, trucks, conveyors, materials-handling equipment, office equipment, and a 12x18-in. lucite planning board, columns, and layout tape.

The kit is not for a specific plant, but will enable the user to test this type of planning.

Visual Planning Equipment Co. Inc., Pennsylvania Ave. and River, Oakmont, Pa.
(MORE DATA? CIRCLE FYI 72, p. 161)



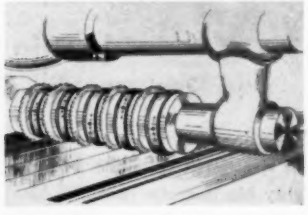
DUST COLLECTOR, known as the Dustkop Model 20B30 uses the basic elements of the company's previous models, plus a storage bin on casters. The bin is of 9 cu. ft. capacity and is so arranged that it receives the bulk of the collected dust directly from the bottom of the separator. Suction capacity of the collector is 2,405 cfm on a 7-in. inlet pipe.—*Aget-Detroit Co., 130 Main St., Ann Arbor, Mich.*
(MORE DATA? CIRCLE FYI 73, p. 161)

Marquette AC Arc Welders Reduce Power Consumption

These industrial welders are available in three sizes—200-, 300-, and 400-amp capacities, and are claimed to be designed for heavy-duty, round-the-clock welding.

Known as the A series, the welders use Hipersil steel transformer cores, which provide 1/3 greater flux - carrying capacity, reducing power consumption and operating costs.

Marquette Mfg. Co., Minneapolis, Minn.
(MORE DATA? CIRCLE FYI 74, p. 161)



Dayton Rogers Adjustable Collars Accurately Space Milling Cutters

The spacing of the cutters is easily made by loosening the cutter arbor nut, making the plus or minus adjustment with a special spanner wrench which is furnished. The collars are calibrated by thousands, although an adjustment of a quarter thousandth can be made by visual means.

The collars are provided with keyways and are hardened and ground. They are made in sizes for all standard milling machine arbors from ⅞ to 2 in., and have a maximum adjustment of 3/16 in.

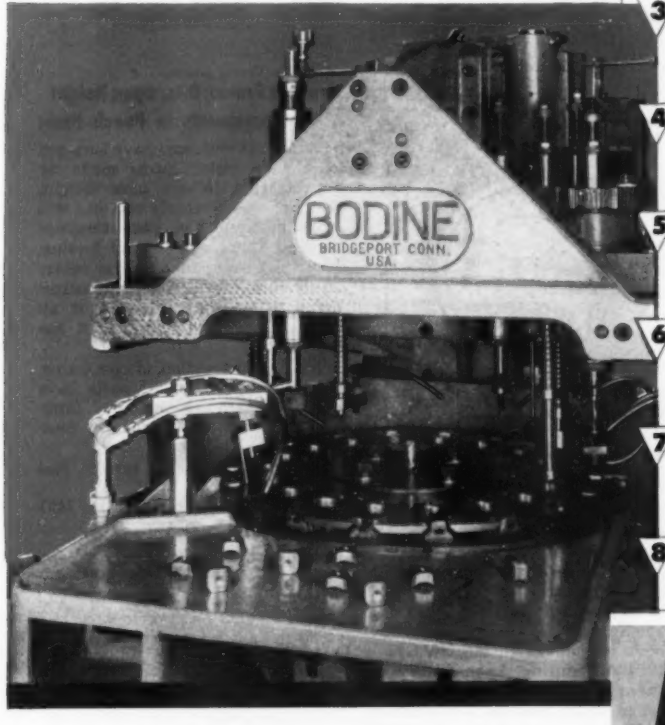
Dayton-Rogers Mfg. Co., Minneapolis, Minn.
(MORE DATA? CIRCLE FYI 75, p. 161)

Bodine CASE HISTORY NO. 28

PRODUCTION: The Bodine 42-30 automatic dial type drilling and tapping machine (one of 6 standard sizes) is equipped with 5 drill spindles (one inverted) and 1 tapping spindle. Production: 15 pieces (or 90 operations) per minute.

For high speed repetitive production of small components, in drilling, tapping, milling, screw inserting, staking and assembly operations, Bodine Automatics lead the field. Check them for Ordnance work . . . ask us for Case History facts on World War II production. You'll need them for competitive contracts for today's production.

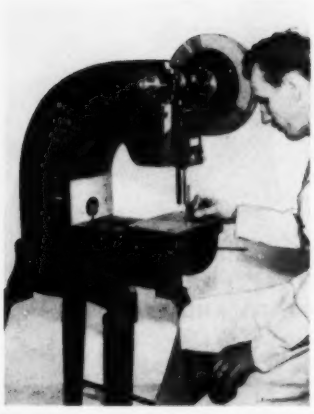
ACCURACY: *Hole position held to within ±.005". Much closer tolerances can be maintained on a production basis.*



PROCESSING STEEL POLE PIECES FOR ELECTRIC MOTORS AND STARTERS

"You Can't Meet Tomorrow's Competition With Yesterday's Machine Tools"

THE **Bodine** CORPORATION
BRIDGEPORT 5, CONNECTICUT
AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES



Clutch-Drive Dog On Punch Press Eliminates Slot in Crankshaft

This 4-in-1 four-ton punch press features: a sturdy 400-lb cast frame, 12¾-in. throat, and a clutch-drive dog built into the clutch collar instead of a slot in the crankshaft. This was done to eliminate weakening the one-piece shaft by deep milling. A trip mechanism permits the operator to change from single to continuous ramming without stopping the press.

An adjustable bed permits quick conversion from the standard press to long punch, half, or horn press. Connecting-rod bearings are of steel-encircled bronze-lead alloy, giving long life and efficient lubrication.

Kenco Mfg. Co., Los Angeles, Calif.
(MORE DATA? CIRCLE FYI 76, p. 161)

Dry-Chemical Extinguisher Has 150-lb Powder Capacity

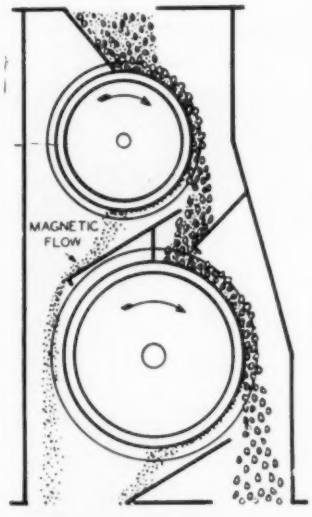
This wheeled fire extinguisher combats flammable liquid (Class B) and electrical (Class C) fires in many industrial plants and mills.

Mounted on two wheels, and properly balanced to permit one-man use, are two large upright steel cylinders. The larger cylinder contains 150 lb of dry chemical, the smaller cylinder holds nitrogen under pressure of approximately 2000 psi.

To operate, a valve on top of the nitrogen cylinder is opened, admitting the gas to the powder chamber through a normally open valve. A preset regulator maintains constant pressure within the dry-chemical cylinder during discharge, and a safety valve prevents damage to the powder cylinder if the pressure should exceed that for which the regulator is set.

The nozzle is controlled by a lever having three positions: off, fan, and straight.

Walter Kidde & Co., Inc., Belleville, N. J.
(MORE DATA? CIRCLE FYI 77, p. 161)



Non-Electric Double-Drum Magnet Automatically Separates Scrap

This unit, using an Alnico permanent magnet, is said to be suited for separate non-ferrous chips and fine borings containing less than 10% iron contamination.

The separator uses two magnetic Perma-Drums, one mounted directly above the other, and enclosed in a dust-tight housing. Each drum consists of a stationary magnet assembly around which revolves a non-ribbed armor-plate drum shell. Non-magnetic material flows over the drum shell in a normal trajectory. Magnetic materials are held fast to the surface of the shell for one-half revolution until they are carried to a point beyond the magnetic field, where they are separately discharged.

As the material is spouted from the first to the second drum, it is turned over, so that a more effective secondary separation takes place. This is claimed to be particularly helpful on borings and turnings where the iron contamination may be imbedded in the curls.

Dings Magnetic Separator Co., 4740 W. Electric Ave., Milwaukee 46, Wis.
(MORE DATA? CIRCLE FYI 78, p. 161)

Stronger Frame, 8-in. Open Height Are Improvements in Punch Press

Several improvements have been put in a 4-ton punch press made by Benchmaster. Where open height, ram up, was formerly 6¾ in., this model possesses 8 in., permitting use of higher dies and special tooling. The press can punch to the center of an 18-in. circle. Frame construction has been strengthened at all stress points, and a knockout has been added.

With the exception of the frame, trip link, and legs, all parts have been standardized and are interchangeable with the regular four-ton model.

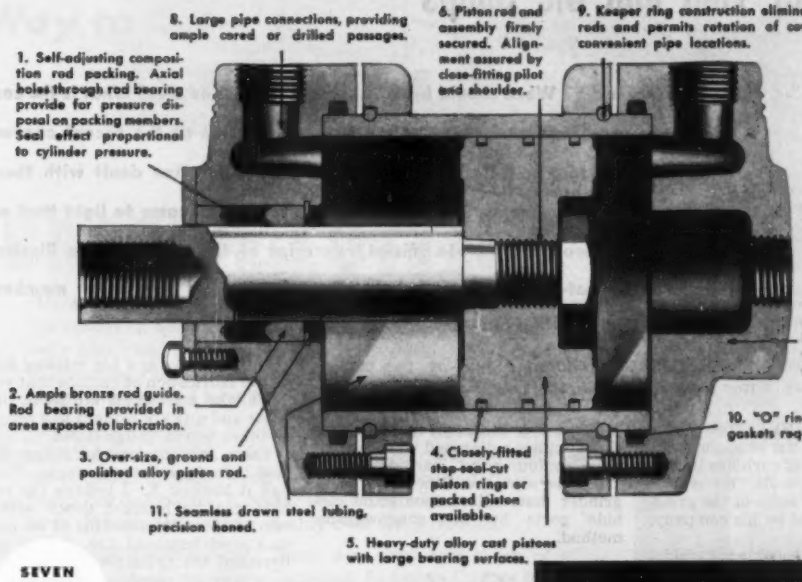
Benchmaster Mfg. Co., 2952 W. Pico Blvd., Los Angeles, Calif.
(MORE DATA? CIRCLE FYI 79, p. 161)

Portable light has a permanent-magnet base with a 50-lb pull. Called Miti-Mite, the equipment consists of the base (1x1 ⅛x1½ in.), a ball stem, and a bracket assembly having a socket clip. The clip holds a light socket for 25- or 40-watt bulbs.

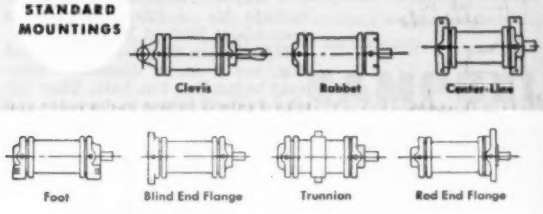
Two features which make the light easily adjustable to any position are: the ball stem swiveling in a knurled nut, and the concave base which enables the light to be mounted on either flat or curved surfaces.

Enco Mfg. Co., 4522 W. Fullerton Ave., Chicago 39, Ill.
(MORE DATA? CIRCLE FYI 80, p. 161)

More Power to You


8. Large pipe connections, providing ample cored or drilled passages.
6. Piston rod and assembly firmly secured. Alignment assured by close-fitting pilot and shoulder.
9. Keeper ring construction eliminates tie rods and permits rotation of covers to convenient pipe locations.
1. Self-adjusting composition rod packing. Axial holes through rod bearing provide for pressure disposal on packing members. Seal effect proportional to cylinder pressure.
7. Heavy-duty alloy covers, bored to fit a turned diameter on tube.
2. Ample bronze rod guide. Rod bearing provided in area exposed to lubrication.
10. "O" ring seals. No gaskets required.
3. Over-size, ground and polished alloy piston rod.
4. Closely-fitted step-seal-cut piston rings or packed piston available.
11. Seamless drawn steel tubing, precision honed.
5. Heavy-duty alloy cast pistons with large bearing surfaces.

SEVEN STANDARD MOUNTINGS



..with RIVETT HYDRAULIC CYLINDERS

You'll find the performance of Rivett hydraulic cylinders close to foolproof. Designed with the utmost simplicity, they have no tie rods — keeper ring design permits covers to be rotated to convenient pipe connections and installation made in a minimum of space. External "O" rings are used as static seals to eliminate gaskets and assure leakproof operation. Sealing efficiency improves with increased pressure. Closely fitted automotive type piston rings reduce friction to a minimum.

Available in three pressure ranges: to 300 P.S.I. maximum and 1500 P.S.I. maximum service with standard models. 3000 P.S.I. maximum and higher services furnished on application. Seven standard mountings, in 10 bore diameters, in any stroke up to 96", with standard size or 2:1 over-size piston rods, cushioned rod end, blind end or both. Special covers supplied. Send for Catalog Section 104.

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DEPT. AM-3, BRIGHTON 35, BOSTON, MASSACHUSETTS

RIVETT furnishes a complete power package

VALVES • CYLINDERS • POWER UNITS
Air and Hydraulic
All sizes and types

CARBIDE PROBLEMS
in Contract Tool and Die Shops

What is Method X? When should brazing be used in carbide dies? What is the cost increase of a carbide die over steel? A panel discussion at the recent convention of the National Tool and Die Manufacturer's Association dealt with these and other carbide problems. So much valuable information came to light that we are publishing here the complete official transcript of the meeting. The illustrations are the not-so-absent-minded doodles of some of the panel members

Preceding the discussion, REHNER *introduced a film on the manufacture of carbides. After this was shown the meeting went like this:*

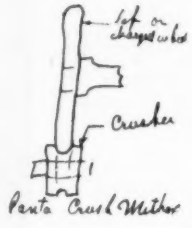
MODERATOR FINNEY: Dick Moore is going to outline the considerations leading to the use of carbides in dies and other special tools. He is also going to tell about some of the grinding procedures used by his company.

MOORE: Broadly speaking, carbides are used where high wear occurs: in blanking, forming and shaping dies; plug, thread and ring gages; all sorts of cutting tools—reamers, drills and cutters. And I might say here perhaps the time is coming when carbide will pretty nearly take over from HSS for cutters.

In carbide fabrication, carbide can be ground with diamond wheels or it can be finished with diamond-charged laps.

Contours can be finished to size on a good many machines. There are some that are supposed to be specially suited for it. I mention here the Studder. It is a Swiss machine. It has a process for grinding contours and carbides and quite a few firms are using that for very small parts.

There is a Wickman machine also that supplies a diamond wheel which will contour-grind carbide parts. There is also the Cincinnati form grinder that will contour grind carbide parts by the shadowgraph method.



There is also our device that we call the "Panto-Crush," which will form carbide to shape up to certain sizes. And of course there can be considerable carbide contour work done on a jig grinder.

I think there is a big missing link in the fabrication of carbide that you can't take a piece off the shelf, like a bar and quickly bring it to a shape. In other words, rough it out.

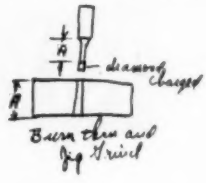
There is a process for doing this that is in experimental stages. They call it Method X. I believe the carbide can be brought down within two or three thousandths of an inch to a predetermined size. I don't understand the principle at all, but it is a way of roughing out a piece. Perhaps Mr. Judkins will tell us more about Method X.

For instance, they can take a round slug, say 6 in. in diameter. They want to put in a 3-in. hole. They can take a tube 3 inches in diameter and cut that hole by this method.

The thing about it that amazes me the most is the fact that they can put a thread in the piece. They can tap a piece of carbide.

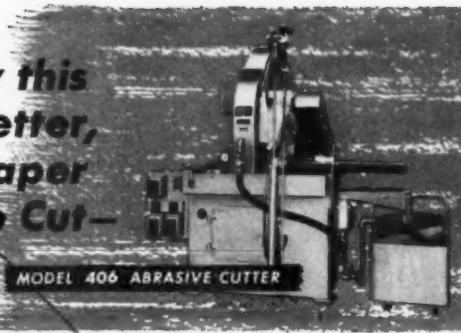
We can also put a hole in the carbide with an ordinary tap extractor. That is, the disintegrating type of extractor. The sizes we put in are ¼, 5/16, and ⅜ in. We have never gone any larger than that—this rough hole can then be jig ground.

I have been told that some of the carbide people are experimenting



PRODUCER REPRESENTATIVES	MALCOLM F. JUDKINS, CHIEF ENGINEER, CARBIDE DIV., FIRTH STERLING STEEL AND CARBIDE CORP.
	PAUL REHNER, ASSISTANT SALES MANAGER, CARBIDE ALLOYS DIV., ALLEGHENY LUDLUM STEEL CORP.
USER REPRESENTATIVES	RICHARD F. MOORE, PRESIDENT, MOORE SPECIAL TOOL CO. INC.
	HERBERT HARIG, VICE PRESIDENT, HARIG MANUFACTURING CORP.
MODERATOR	BURNHAM FINNEY, EDITOR, AMERICAN MACHINIST

Try this Better, Cheaper Way to Cut—



MODEL 406 ABRASIVE CUTTER

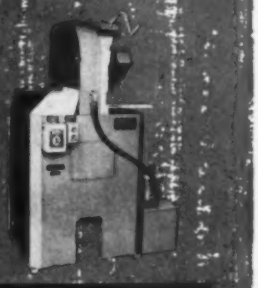
CAMPBELL ABRASIVE CUTTERS

Abrasive cutting saves time. It usually saves a finishing operation because the cut ends are smooth and practically burr free. The abrasive wheel cuts through hardened or annealed steel, non-ferrous metals, plastics, too. Length of cut is controlled to within a few thousandths of an inch.

Safer to Use CAMPBELL ABRASIVE CUTTERS are safer to use because cutting wheels are enclosed in steel. Work clamp, work stop, and coolant pump are automatic. Coolant is distributed equally over work. Wheels last longer, quality cuts are produced.

Choice of Styles There are sizes and styles of Campbell Abrasive Cutters for every job. All are completely re-engineered for production performance . . . ready for the emergency.

MODEL 223 ABRASIVE CUTTER



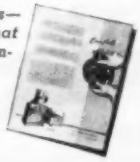
MODEL 15 ABRASIVE CUTTER

AND...CAMPBELL NIBBLERS

Cutting odd shapes from sheets of ferrous and non-ferrous metals is quick and inexpensive on a CAMPBELL NIBBLER. A rapid circular punch and die take "bites" out of sheet guided by operator. Work feeds in any direction. Any shape of hole can be cut in center of sheet without cutting perimeter. 40 to 60 times faster than drilling and filing.

MODEL 2524 NIBBLING MACHINE

YOU TELL US—Campbell has the machines—Abrasive Cutters and Nibblers. You tell us what your job is. We'll send literature and make recommendations.



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AMERICAN CHAIN & CABLE

TRADE MARK

923 Connecticut Ave., Bridgeport, Conn.

CAMPBELL Abrasive Cutters AND Nibblers

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grinding wheels

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Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

with a method whereby they will be able to rough out a piece, so you could take a piece off the shelf and rough it out close to dimensions. The main advantage would be the delivery angle, to get deliveries of special shapes. There are two angles —delivery and cost.

To get delivery requires quite a bit of time. If you have 1,000 pieces to make, it doesn't bother you so much. If you have just one piece, it is quite a wait. If the carbide supplier could take a piece off the shelf, cut it off and form it and put holes in, that would very helpful. That is going to have to come along if carbide usage is to be greatly increased.

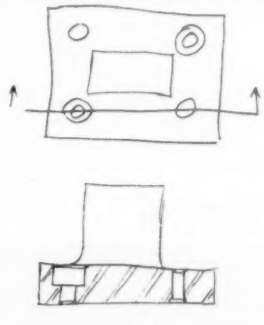
HARIG: First, I would like to go into the relation of the preforming to the die design. First of all, there is a limit of size. The various carbide suppliers have a little variation as to the limit of how big they can go, but for the average run of die-making they pretty well cover any of the requirements we have ever run across. If you ask for too big a piece, you are going to find that you are going to have too much grinding allowance. That is one of the things Dick (Moore) has just referred to which is really a big problem to us.

The cost of removing stock is just a waste. The bigger the piece you get, the more you have to allow for grinding. That is one of the most expensive parts of handling. You can't do it any other way than using diamond wheels. The lap method has its limitations.

The grinding allowance is something that I would rather leave to the carbide people themselves to give you an explanation of what you can expect, and from that you have to determine what kind of a die section you are going to lay out when you determine what kind of a die you are going to build.

In conjunction with that, you have to take into consideration what type of mounting you are going to use and determine the method of holding the carbide.

Now, we have experienced only



Protective Clothing

CUT HANDLING COSTS with these COMFORTABLE, HEAVY-DUTY AO GLOVES!

Where back of hand protection is not needed, AO 5X264 and 5X284 gloves can be real money-savers. Cotton fleece backs not only reduce the cost but add flexibility and comfort.

Both gloves are real heavy-duty types with heavier leather in the palm or work area and steel sewed seams. Leather palm extends over the heel of the hand, thus eliminating an uncomfortable bib patch while affording equal protection.

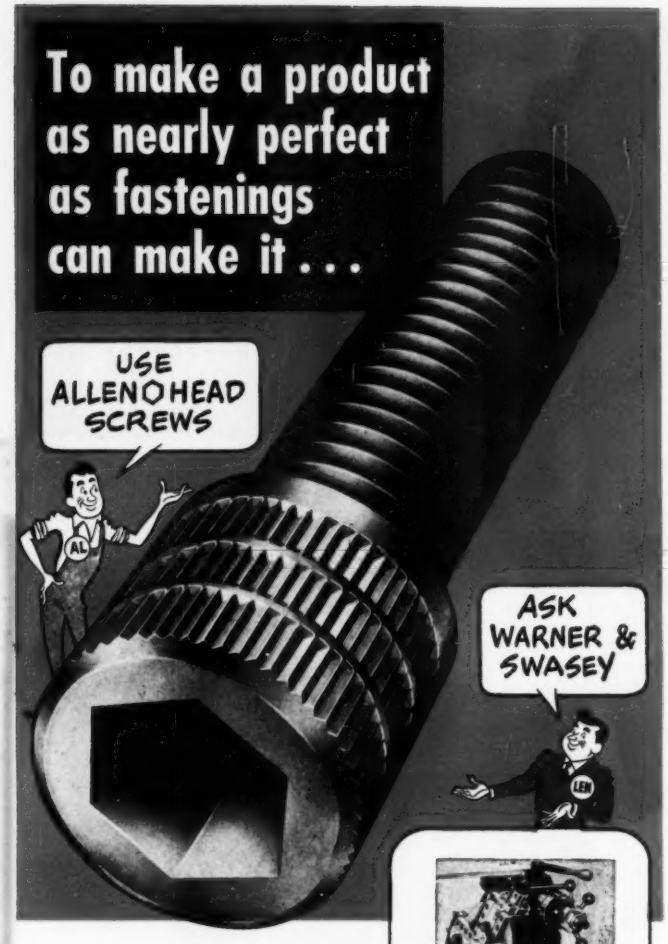
Other features of both gloves include absence of seams around index finger . . . a heavy, reinforcing steel stapled strap around thumb crotch which reduces wear at a vulnerable point . . . heavyweight safety duck cuffs with heavy tape binding and elastic on back for snug fit.

Ask your AO Safety Products Representative for the 5X284 if you prefer seams on the back of the fingers rather than on the face, as in the 5X264. Costs are equally low and the leather of both gloves is chrome tanned cowhide.

American Optical COMPANY
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

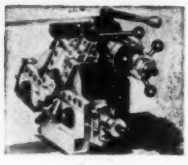
To make a product as nearly perfect as fastenings can make it . . .



The only place to use a cheap screw is when you don't care if it holds or not. Usually shearing or loosening costs thousands of times what you "save" on the cheapest fasteners.

You pay no premium for *genuine* Allen Head screws—only enough to *assure* uniform strength and Class 3 fit.

Allen gives you the toughness of Allenoy steels, 100% Pressur-forming, the advantage of every proved threading method, quality control at every step, including automatic instrument controlled atmosphere heat treating.



This leading machine tool manufacturer uses Allen Head screws by the hundreds of thousands for compact design, assured holding power and maintenance of precision adjustments.

SOLD ONLY THROUGH LEADING DISTRIBUTORS

Write the factory direct for technical information and descriptive literature.

WARNING
Allen-Type screws aren't necessarily Allen-Made.
Get genuine Pressur-formed Allen Head screws in this black and silver box.

ALLEN ALLEN HEAD

MANUFACTURING COMPANY

Hartford 2, Connecticut, U. S. A.

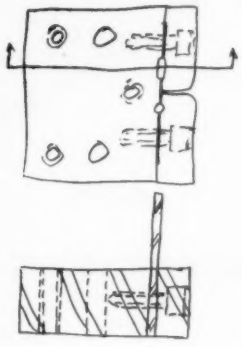
NEW YORK, CLEVELAND, DETROIT, CHICAGO, LOS ANGELES

a few different methods which seem to be quite satisfactory.

One point that I would like to make is that carbide is gradually getting closer to being applied just as you apply steel. They can put holes in for you so you can screw and dowel a piece down, like you would a base punch. The tapping is comparatively new. What we have been using is a counterbore, mounting the piece with the tapped hole in the punch holder or the die shoe, whichever way you happen to hold your piece. The dowel hole would be whatever size of dowel you want to get. So you have no special adaptation (see page 174).

Another method which is a popular one today is to provide a yoke or pocket in the shoe. In this method you just have to have a couple of holes or just one hole in each piece to hold the carbide down, and you confine it in position by your pocket. That requires some pretty accurate die grinding to retain your relationship the same as you would apply a steel sectional tool (see page 178).

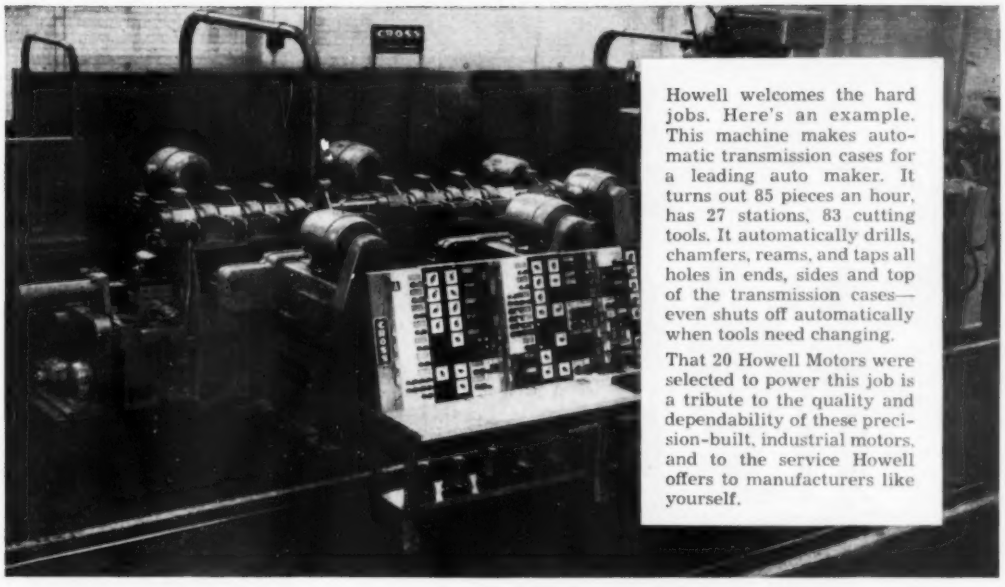
There is another method that ties in with the yokes and pockets. That is a method of clamping. We have applied quite successfully a side pressure clamping of punches to a hardened punch plate. That is done



Clamp Type Punch Plate

where you find it advisable to have interchangeability and replacement. It makes it quite reasonable in that respect after the initial tool cost is done, although it is a high initial cost. It is a very satisfactory method of holding the carbide.

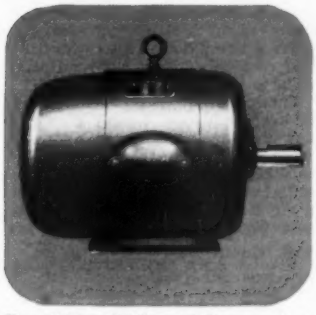
There is one method which is gradually going out of the picture. That is brazing. That was the initial method of applying carbide in the stamping game and it was quickly found that due to the pounding which you get from your cutting action that the brazing material itself powdered and disappeared and the carbide fell off. From our experience, the brazing method can be applied just to a limited extent. We stay away from it completely be-



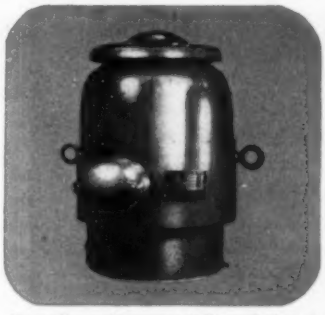
Howell welcomes the hard jobs. Here's an example. This machine makes automatic transmission cases for a leading auto maker. It turns out 85 pieces an hour, has 27 stations, 83 cutting tools. It automatically drills, chamfers, reams, and taps all holes in ends, sides and top of the transmission cases—even shuts off automatically when tools need changing.

That 20 Howell Motors were selected to power this job is a tribute to the quality and dependability of these precision-built, industrial motors, and to the service Howell offers to manufacturers like yourself.

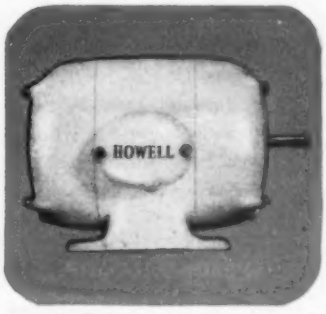
Solution for . . .
THE CASE OF AN AUTOMATIC TRANSMISSION



Howell Type K Motor. Offers constant performance in the presence of dirt, dust, fumes, and moisture. Sizes from 3 to 150 H.P. at 1800 R.P.M. Either vertical or horizontal mounting.



Howell makes specially designed motors—vertical, round body, flange and face mounting, built-in stator and rotor jobs, etc.—to meet a wide range of requirements.



Howell Sanitary Motors meet the most exacting standards of the dairy and food industries. They contain no pockets, cracks, or crevices. Available for vertical or horizontal mounting.

Read this if you need special motors

Howell offers a unique job-engineering service for special motor applications.

With it, you get: (1) cooperation of our engineering personnel; (2) prompt quotations on both standard and custom motors; and (3) the ability to accurately manufacture custom-designed motors within reasonable time.

We believe these services will save you, as a purchaser of electric motors, valuable time and money.

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Precision-built Industrial Motors Since 1915

HOWELL Red Band MOTORS

OUT OUR WAY
OH, BALONEY! YOU'RE LIVIN' IN THE OLD HORSE AN' BUGGY DAYS! A MOSSBACK OF THE OLD MUSTY MAUVE DECADE!
YEAH? WELL, IT'S THE OL' BOYS OF TH' MUSTY MAUVE THAT MADE IT POSSIBLE FER YOU TO HAVE WHUT LITTLE BRAINS YOU GOT! WHO INVENTED ALL TH' MODERN CONVENIENCES -- SOME JITTERBUG LIKE YOU? HAH!
HE'S RIGHT -- YOU HAD TO RIDE IN AN OXCART TO WANT SOMETHIN' BETTER ... THIS GENERATION IS GETTIN' TOO COMFORTABLE, I THINK!
THERE'S ONE IMPROVEMENT THEY AGREE ON, THOUGH -- SOL-SPEEDI-DRI! TH' BOY IS SORE BECAUSE IT WAS OLD JOE WHO FIRST THOUGHT T'SEND FOR A SAMPLE!
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AM 3-5-51

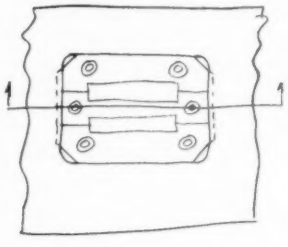
cause of the risk factor but if there is a little job that does not require much cutting pressure, you can get away with it, but it is not advisable. Ordinarily, if you are going to have enough production to warrant the use of carbide you might as well go the whole way and do the job right and put in a big enough piece of carbide so you can clamp or mount it with screws or dowels.

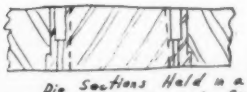
There is another thing you have to keep in mind in your die construction. When you arrange your sectioning the same as you do in steel, you get a different problem of grinding, because you can't just take a diamond wheel and dress a radius to suit whatever corner condition or whatever contour is required because the diamond wheels are too expensive. You have to section it so you can set your work piece up on straight lines or angle or generate curves by swinging the piece. You have to give a lot of consideration to sectioning in this connection.

Some of the die construction principles that you want to follow are: First, selecting the proper grade of carbide. Now in the stamping game, which is what we have mostly been involved in, it has gotten itself down to pretty much one grade of carbide. Any time you want to go into applying carbide to stamping, it would be my suggestion to call in the carbide people and have them give you their recommendation because they have had the broadest knowledge of what is being done. After you have had experience then you can start using your own judgment.

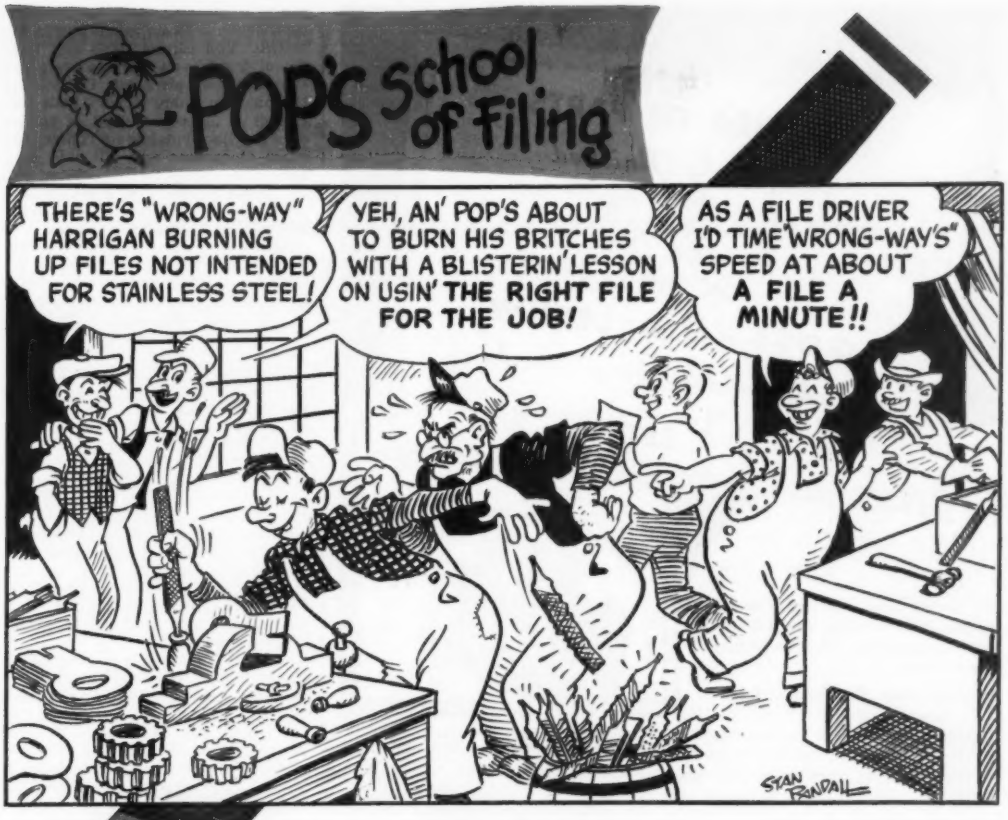
There are limitations that you have to keep in mind. I can't give you any definite figures but don't get the sections too small in width or thickness. Pay a little more for the initial carbide and be sure you have a big enough piece that is going to take whatever punishment it is apt to get.

Second, press fits. You have to be





Die Sections Held in a Yoke or Pocket + Held Down by Screws, Shoulders or just a press fit in the rectangular pocket


POP'S school of Filing
THERE'S "WRONG-WAY" HARRIGAN BURNING UP FILES NOT INTENDED FOR STAINLESS STEEL!
YEH, AN' POP'S ABOUT TO BURN HIS BRITCHES WITH A BLISTERIN' LESSON ON USIN' THE RIGHT FILE FOR THE JOB!
AS A FILE DRIVER I'D TIME 'WRONG-WAY'S" SPEED AT ABOUT A FILE A MINUTE!!
STAN RANDALL

LIKE any foreman interested in high production with minimum tool wastes, Pop can't be blamed for "blowing his top" over the sad scene enacted above. Using the wrong file for the job is as costly a tool abuse as using any file carelessly. Take stainless steel, for example:

Stainless steel is a tough, dense metal which tends to have a wearing effect on all cutting tools —and files are no exception. Better results are obtained when Nicholson or Black Diamond files "For Stainless Steel" are selected. These are made with specially sharpened teeth to assure faster cutting and longer file life. They are made in the same types and sizes as regular-purpose files. "For Stainless Steel" is stamped on the tang. Sold through industrial distributors.

THE NATIONAL DEFENSE PROGRAM calls for again conserving steel. You can aid by making files last longer—(1) through correct use and proper care of files and (2) through use of *The right file for the job.* The following booklets, handed to purchasing and production heads, are valuable helps. Write for as many copies as you can use judiciously.

"TEN SPECIAL FILE TYPES" *"FILE FILOSOPHY"* *(on kinds, use and care of files)*

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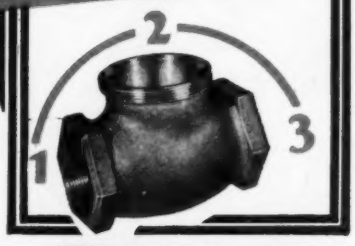
(In Canada, Port Hope, Ont.)

NICHOLSON . . . A FILE FOR EVERY PURPOSE

ALL ENDS OF PARTS
Completely Finished
"1·2·3"
ON THE
GOSS *and* DeLEEUW
Automatic Chucking Machine
in 1 SET-UP

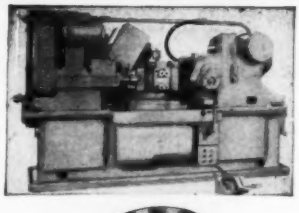


This recent Goss & DeLeeuw development has already received universal acclaim as an outstanding development.

In speed, ease of tooling and precision finishing, the "1-2-3" chucker provides engineering advantages which result in vastly greater production at a fraction of parts' costs by other methods.

Easy, fast change-over from job to job makes this machine ideal for short-run requirements. Sturdy construction, power and speed make its advantages apparent on long runs.

"1-2-3" means ability to handle work requiring machining operations on one, two or three ends simultaneously or in sequence — a method exclusive with Goss & DeLeeuw and offered on this machine.



Illustrated literature available promptly on request. Send samples of your work for time and cost estimates.

GOSS & DeLEEUW

GOSS *and* DeLEEUW
MACHINE COMPANY, *KENSINGTON*, CONN., U.S.A.

pretty careful on that. Carbide has its shortcomings on account of being brittle. You cannot have any tight dowel fits; if you do, you are going to crack your piece off. On holding the piece in, there is very little limitation as to pressure but, if you go too far, when you have a rather long piece of carbide and put side pressure on to any excessive amount you are going to bow your pieces in and actually bend the carbide, which the carbide manufacturers told us couldn't be done. We have found that carbide will definitely bend. We have been able to push it in half a thousandth, even a thousandth, so you can have too tight a fit in the mounting or confining of the die sections.

In reference to the punches, we feel all small perforators should be definitely guided in the stripper. There is a difference of opinion as to what the guide can do. In some cases, we have used carbide in the stripper to guide the punches, but use tool steel in most cases. If you have large enough punches that can be mounted with screws and dowels with a base or if you are going to clamp them, and if they are big enough and sturdy enough, you don't have to worry about guiding them in the stripper. They get by standing on their own.

One advantage that brings itself up is the fact you don't have to have carbide punches as long as you have to have steel in order to get life out of the die. You don't have to worry about the grinding life that you had to concern yourself about in steel. That makes your punches sturdier.

The principles of taper and die clearance we have experienced are identical as applying to steel. I should say in reference to the sectional ground high carbon, high chrome or high-speed dies, the same principles we find applying to them as apply to carbide in the same manner. There is nothing new there. You just have to apply those same principles. You can't get by with too little taper on carbide. If you think carbide is going to take care of all of your troubles, you are mistaken. You have the same problems in the use of steel, only you get a great many more parts per grind out of the tool.

Another thing that is very important, and we stress it very highly, is to use a first-class die set. Now we preferably use a four-post die set if we possibly can. Some of the methods that some of the manufacturers use make it prohibitive to use a four-post. You just can't get it in their setup. We feel it is a much better tool with four posts than two. We also had trouble with line-up. The two posts don't give you as much accuracy as the four, and the four posts will help a great deal in giving you a good, accurate alignment. But I don't mean to say a

Hanson-Whitney

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To better serve our customers in their own territories, Hanson-Whitney Taps will now be merchandised thru a national set-up of Industrial Distributors. Standard sizes and types will be stocked in important tapping centers for fast delivery to more users, over a greater area.

During 1951 we shall back up our Distributors with H-W advertising in 8 publications reaching 1,587,600 readers. We have a new, sturdy, attractive, clearly marked package. Dealer helps will be supplied from time to time . . . and every effort will be made to insure better tapping results at lower costs . . . with recommendations from H-W engineers on request.

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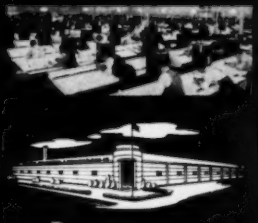

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ENGINEERS, DESIGNERS, CONSULTANTS AND PRODUCTION SPECIALISTS

19651 JOHN R STREET
DETROIT 3, MICHIGAN

INQUIRIES PROMPTLY ANSWERED

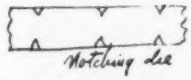
four-post die set is going to take care of any of the ills in a punch press.

We strongly recommend that before you ever take a carbide job on for a customer, that you be sure they know how to use a carbide die, or at least that they have had some experience in running good high production tools. If you place a carbide tool in a shop that has poor press conditions and doesn't give any consideration to the way the dies are handled, you won't get the production out of the die.

The press conditions should be held to—well, to a thousandth. The clearance between the gibs on a press should be very accurate and the parallel condition between the ram and the bolster shouldn't be out more than a couple of thousandths, because all of those things add up to higher production.

Another thing that is very important when considering the proper press for the job is that you have sufficient tonnage. When you put a die in a press, be sure it is rated for sufficient tonnage. This also applies to steel: it isn't just a carbide application, but if the tonnage factor is on the close side, the die will give you less parts per grind, because there is more vibration, more shifting, and whatnot that transfers itself in the dies and has a tendency to dull the punches. A bigger and accurate press will give you more parts.

We feel that the carbide die is the coming thing. We have been at it about five years now and any job that we formerly made out of high carbon, high chrome steel we find can be nicely applied to carbide and will pay for itself. Production has to be pretty high. When you talk about even one million parts, it is sometimes doubtful whether to go into a carbide, but not when the job is going into two, three and four million.



We have found that the application of carbide has fitted itself mainly into motor and transformer lamination business. That is one of the highest production items in industry, and there it has done such an outstanding job that it is unbelievable. Just as a matter of the average figures, you can figure at least a 10 to 1 ratio of what you can get from a carbide die as against the high carbon, high chrome die of high quality.

Quality is another thing you have to keep in mind if you should get involved in building a carbide die. A customer has a tool steel die from which he has been getting 50,000 parts per grind. If the tool is a high-grade tool, he will find it is about a 10 to 1 ratio. If the tool steel die is one that is poorly made, you can expect a greater difference. A 10 to

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DESIGN LEADERSHIP

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TYPES A*, C and D
30, 60, 100 and 200 Amp. Sizes

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is reflected in the many design and operating features of this completely new line

Type A switches have full interlock, visible blades and magnetic arc plate as well as a simple, quick-make-and-break mechanism, dead front line terminals, positive pressure fuse clips, multi-spring jaws, silver-plated current carrying parts and removable pressure connectors.

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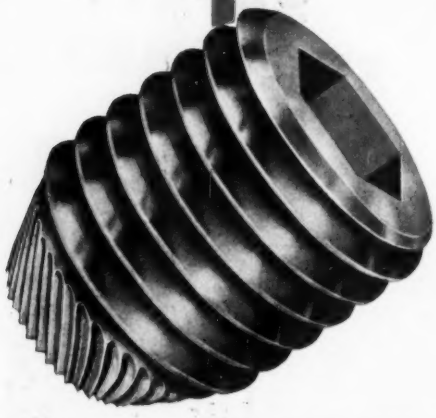

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Your local UNBRAKO Distributor has full stocks of standard UNBRAKO catalog items on his shelves—ready for immediate delivery.

But "specials" are another story. Due to shortages and increased demand, deliveries are uncertain, costs prohibitive.

And in many cases you find that "specials" are so close to the borderline that "standards" could easily be adapted.

So why not have your requirements re-checked? There may be many places where UNBRAKO "standards" could be used to advantage. If you wish, our "fastener engineers" will be glad to make recommendations. No obligation, of course.

And if you don't have our latest catalog
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Knurled Socket Head Cap Screw
Flat Head Socket Cap Screw
Knurled Point Socket Set Screw
Knurled Socket Head Shoulder Screw
Fully-Formed Pressure Plug
Precision-Ground Dowel Pin

SPS STANDARD PRESSED STEEL CO.

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FOR YOUR UNINTERRUPTED PRODUCTION

1 ratio is a fairly safe thing to consider and you wouldn't be sticking your neck out by promising this ratio to your customer.

Generally, when carbide dies are referred to, you find people expect to get one million parts per grind right away. This may be true, depending on the nature of the material they are running in the die. Take whatever they are getting out of a comparable steel job and multiply by 10. That is what they can expect to get.

JUDKINS: In our work, we are concerned with three dimensions—mass, length, time.

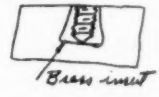
Mass is just another way of saying energy, according to our friend Einstein, and the measure of man's progress is his conquest of these dimensions of our world.

We have conquered time to a great degree. Our homes and manufacturing establishments are replete with time-saving devices. Living a few minutes today is equivalent to living the life of Methuselah in his time.

We have also conquered energy or at least put it to work in various ways. We have substituted mechanical power for muscle power to the extent that every living person today has at his command about 7 horsepower for performing this complicated business of living and making a living.

Now we come to the last of these dimensions—length. You know that also is a measure of man's progress. These wonderful devices which we enjoy today are made possible because of our use of close work. In the time of James Watt, his original steam engine we are told was a masterpiece of precision workmanship. The piston fitted the cylinders with a clearance less than the thickness of a worn shilling.

Originally, the cubit was the length of some Egyptian ruler's forearm and the foot was the length of some English king's nether extremity. The inch, of course, was a twelfth



Hole drilled in carbide by method X

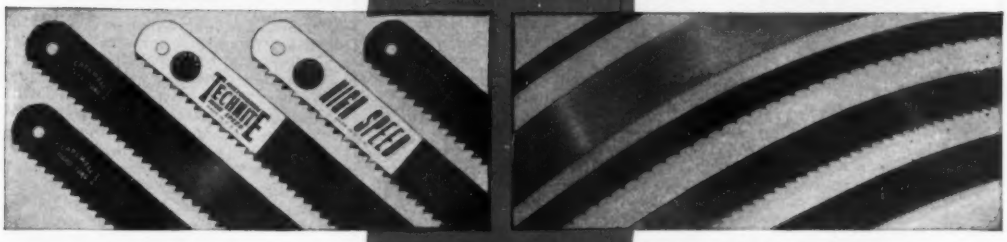
of that, and we have gone far since that. Today, a thousandth of an inch and even a tenth is too big a unit of measurement. We are measuring in millionths and we are working in millionths, even on turning and boring.

Now the interesting thing about this is, you spend the time winning a metal from the ore. You produce it as a casting or forging. You put it through heat treatment and finally machine it, grind it, perhaps lap it to its final size to perform a function as a tool or die. The interesting and important thing is, after having done this how long will it last?

That is where carbide is supreme.

CAPEWELL

MADE WELL TO CUT WELL



HACKSAW BLADES

Power blades: HIGH SPEED, made of 18-4-1 tungsten high speed steel; TECHNITE, made of molybdenum high speed steel; SAFETECH, high speed blade, softer backing for safety, shatterproof.

Hand blades: HIGH SPEED, TECHNITE, FLEXTUNG, FLEXLOY, *and* HARDTUNG; these five types available in two lengths, and four different tooth counts, cover every requirement from skilled tool room work to home work shop.

BAND SAW BLADES

Capewell Flexible Back Hard Tooth Band Saw blades for metal cutting are made from carefully alloyed and processed tool steel and only the full tooth is hardened, giving a tough, flexible body complemented by sharp, precisely set and hardened teeth. They are available in Contour saws, Cut-off saws and Skip Tooth saws. *Capewell Spring Temper* band saws are made from a tough, resilient alloy steel suitably hardened throughout. Capewell narrow Wood Cutting Band Saw Blades have proper hardness for clean cutting, yet the flexibility to stand bends and strains.

How's your S-I-Q?*

1. In power cutting with a hacksaw how many teeth should be in contact?
2. Should saw be tight or a little loose? (power cutting)
3. Why do hand hacksaw teeth break?
4. Why do hand hacksaw teeth get round?
5. Why do band saw blades break?
6. Why does a band saw sometimes cut crooked?

*(Saw Information Quotient)

The answers

1. At least three, commence on greatest area — where most teeth are in contact.
2. ALWAYS tight — loose blades wear quickly and won't cut straight.
3. Frequently it is because tooth size is too coarse ... use blade with twice as many teeth per inch work.
4. Blade slipping — use slower speed or heavier pressure on forward stroke.
5. By being pulled in the cut — because guides too far apart or misaligned.
6. Usually misalignment or improper spacing of guides.

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"DAFILES"

THE *new* 360° ALL PURPOSE SAW

"Dafiles" cut almost any material in any direction, fit Capewell or other standard hacksaw frames when used with Capewell Dafile-links; can be used for high speed cutting in power jig... ideal wherever you have a radius cutting problem, the need for sharp turns, or intricate patterns to cut.

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65 Governor Street, Hartford, Connecticut

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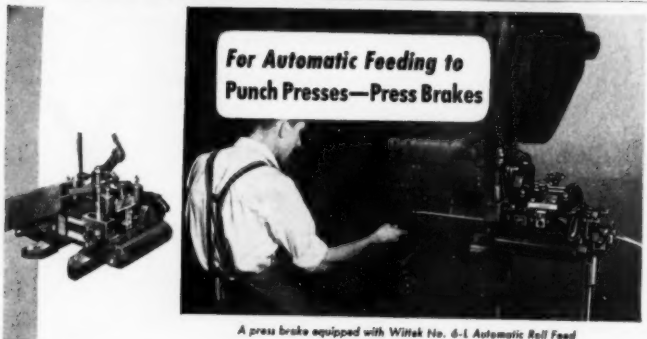
See why at your "K-O" distributor . . . or write for descriptive literature

K. O. LEE CO.
ABERDEEN, SOUTH DAKOTA



A press brake equipped with Wittek No. 6-L Automatic Roll Feed

You Can't Beat WITTEK

Wittek Roll Feeds are made in standard models to meet every requirement in the automatic feeding of strip stock to punch presses or press brakes. The distinguishing feature is their simple and economical method of operation which does away with complicated parts thereby assuring *speed* and *accuracy* in the feeding of various kinds and thicknesses of material.

Wittek Adjustable Reel Stands are designed as companion units to Wittek Automatic Roll Feeds and are available in seven different models to handle *ALL* types of coiled strip stock and wire being fed to punch presses or similar production machinery.

Special units of Wittek Automatic Roll Feeds and Adjustable Reel Stands are engineered to meet unusual requirements.

Write for complete descriptive literature

WITTEK Manufacturing Co.
4320 W. 24th Place
Chicago 23, Ill.

Automatic
ROLL FEEDS
AND
REEL STANDS

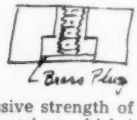
It is durable. Once a carbide item has been finished it will continue to produce accurate parts over many thousands, and as my colleague said over many millions, of identical parts which can be closely fitted in the end item or mechanism.

Now we have come to a realization that in using carbide we must begin to operate as engineers and not as guessers. For that reason, we have carefully measured the properties of carbides. We know, for example, that Young's Modulus of Elasticity for carbide is about 80 million pounds per square inch as opposed to about 29 million for steel. That is interesting, but what does it mean?

It means that in a tool or die structure, we can now deal with such design in terms of numbers instead of guessing. If we know the amount of overhang of the tool, dimensions of the tool, we can estimate the force on the tool, from the speed, the depth of cut from the material being machined or punched and we can compute how much that tool will deflect under load. It is equal to the product of the force acting on the tool, times the cube of the overhang, which is the unsupport, divided by three times E, which is the value for Young's Modulus of Elasticity (modulus means measure and elasticity is a measure of rigidity), times I (the moment of inertia).

This figure (I) is the amount of inertia which we can take from any engineering handbook for the size and shape of the punch or tool.

We have gone much further than that. We have measured the com-



Shouldered hole holds brass plug

pressive strength of carbide. If you had a piece which is loaded axially, we measure the compressive strength as somewhere in the neighborhood of 750,000 pounds per square inch. It is the strongest known material in compression, which immediately suggests that if we support it properly it will not be crushed.

We previously heard mention of the possibility of changing the shape of final sintered carbide. That is readily accomplished. Those of you who read the October, 1950, *Tool Engineer* read of a process which many of us have been using for several years. That is, heating carbide and twisting it or bending it to the required shape.

When we talked about Young's Modulus of Elasticity we were merely showing that carbide is nearly three times as rigid as steel. In order to bend it or expand it or stretch it, it is only necessary to use larger forces than we are accustomed to use in dealing with other materials.

We have also measured the change of dimension of carbide with respect

Wade

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® PRECISION LATHE

. . . a toolmaker's lathe, designed for versatility and fast, effortless operation. Built with all the rigidity and stamina required for carbide tools.

VARIABLE SPEED DRIVE • ELECTRIC TACHOMETER • AMPLE TORQUE
REAR STATION TOOL BLOCK • THREAD-LOCK SPINDLE NOSE (Patented)
AMPLE FRONT GUIDEWAY • FULL BEARING TAILSTOCK
COMPLETE ELECTRICAL SYSTEM

Can be had with *stepless spindle speeds* with ratio as much as 187 to 1.

Swing over bed, 8½" • Distance between centers, 24"
Collet capacity, 1" • Taper standard for centers, No. 2 Morse
Tailstock spindle travel, 3¼" • Tool shank section ⅜" x ⅜"

SEND FOR CATALOG 8A

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"Keep cool everybody! Emil has a grip like a JACOBS CHUCK!"

IF IT'S A

JACOBS

IT HOLDS

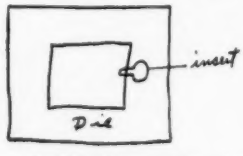
THE JACOBS MANUFACTURING CO., WEST HARTFORD 10, CONN.

to temperature, the so-called linear coefficient of thermal expansion, and we know for the normal grades it is somewhere around 2.5 micro-inches per inch per degree F or about half that of steel. That is important in gaging and other precision work. It is also important in the shrinking of dies.

Suppose we examine for a moment a simple heading die. It is usually composed of an outer casing of steel with a carbide nib with a suitable hole. The wire comes up through this hole and is supported rigidly in position while the amount of wire that sticks out is struck with a heading hammer which upsets the wire into a mushroom head, that is later trimmed with a suitable hex die, for a machine bolt or hex screw.

A study of composite die strength has been reported by the Society for Experimental Stress Analysis. It is a very good article. I recommend it heartily. They made a mathematical and a practical approach to the problem. Realizing that the outside diameter of the casing or support is one of the important parameters, the inside diameter, which is the same as the outside diameter of the carbide nib, and the hole in the nib, which is the product size, are the determining factors together with the length of the insert and the material of which the casing is constructed.

It is important in cold heading, for example, to resist the bursting forces resulting from the operation and just as we do with ballbearing we accomplish it by pre-loading. We give the carbide insert an initial squeeze which helps it to resist the bursting



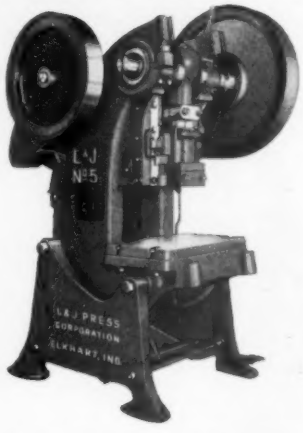
forces developed in service. That is done by an interference fit. We make the carbide nib larger in diameter than the hole in the casing, at room temperature, and heat the casing to a suitable degree to permit introduction of the nib and on cooling to room temperature the contraction of the steel will preload the carbide insert.

The limit of such interference fit by the shrink method is about three thousandths inch per inch of nib diameter. Much heavier fits for more severe service, such as when the head metal is confined within the carbide nib, can be achieved by using a cold pressing technique where we can press the nib in with an interference fit of up to eight thousandths per inch of nib diameter.

I would like to say a little about Method X. You see, our company

L&J PRESSES

Rigid—Dependable



The rigid accuracy of L & J Presses gives you better work — closer tolerances and better finishes — with a minimum of maintenance. It is the result of their heavy construction, advanced design and skilled workmanship. This dependability can mean lower production costs for you.

No. 5 Back Geared Press (illustrated above)

50 ton capacity, 4" standard stroke, 45 strokes per minute, 10¼" or 15¼" die space (bed to slide, stroke down, adjustment up).

No. 1 PRESS

An ideal press for small work, readily adapted to a wide variety of jobs.

14 ton capacity, 1½" standard stroke, 144 strokes per minute, 7¼" or 9¼" die space (bed to slide, stroke down, adjustment up).

Write for literature
12 models—6 to 80 tons

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3820
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BAIRD 54 VERTICAL LATHE showing splash guard for wet operation

4 SPINDLE VERTICAL LATHE

with Continuously Revolving turret

. . . ELIMINATES NON-PRODUCTIVE INDEXING TIME

The Baird 54VC lathe was designed for dry or wet cutting of light jobs, boring piston ends, facing, turning bands, ogives, etc. In this specific job, a Pump Rotor was finished on the O.D. and both faces finish turned and chamfered. The tools feed both on the in and out of the cutting stroke. Work is held on an arbor type holding fixture.

The turret, carrying 4 work spindles and 4 sets of tool bars, rotates at 32 seconds per cycle. Thus, one part every 8 seconds . . . 450 pieces per hour. Stock removal is approximately .012″ on O.D. and .010″ on faces.

Photograph at right shows actual size of pump rotor. See above for operations performed.

The turret is driven through worm and gears . . . spindles mounted in roller bearing and driven by helical gears. Changes in all speeds are easy and inexpensive. Control stations are within easy reach, the spindle control at left; control at right for turret and tool arms . . . protected to prevent feed of tools to work unless spindles are revolving. All electrical equipment is enclosed, with wiring concealed. The Baird 54 Vertical Lathe is a most versatile machine . . . and a profitable one for work within its range . . . so "ask Baird about it."

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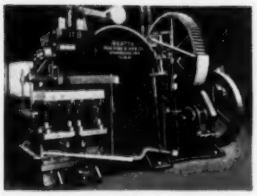
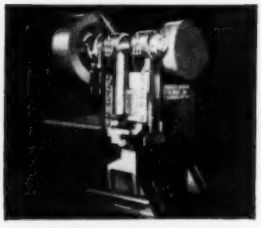
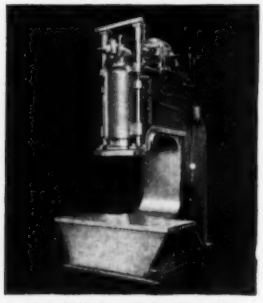


BEATTY No. 11-B Heavy Duty Punch widely used in railroad industry.

Beatty Horizontal Hydraulic Bulldozer for heavy forming, flanging, bending.



Beatty Single End Bar Shear available in capacities up to 300 ton.



Beatty 250-ton Gap Type Press for forming, bending, flanging, pressing.

YOU NAME the problem

WE'LL BUILD the answer

If you have a heavy metal working problem, the odds are that a BEATTY engineer can provide the answer. That's true because BEATTY engineers have designed and built so many special machines that no problem is completely new to them.

Our experience in many fields qualifies us to design and build heavy metal working tools that will speed your production, reduce your fabricating costs. There is a better way to handle most production problems, and our specialty is to help you find that better way.

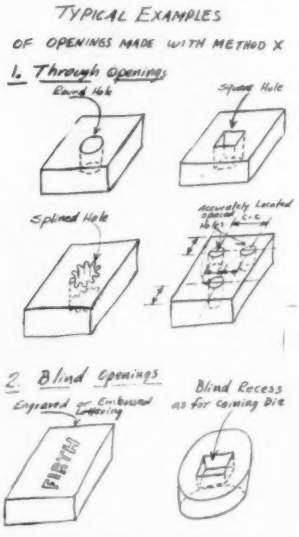
HYDRAULIC SHEET METAL WORKING EQUIPMENT

BEATTY MACHINE AND MFG. COMPANY
HAMMOND, INDIANA

happens to control Method X and I want to caution the Chairman of this meeting that the United States Government has seen fit to clap a secrecy order on this method.

We are permitted to tell you something of what the method will accomplish but not to disclose any of the details because the Ordnance Department has decided it is fundamental to the security of our national defense.

It is a method which for the first time allows penetration of hard, finally sintered carbides up to 81 Rockwell C with any kind of a hole. If you want a spline, square hole,



round hole or hexagonal hole, it can be made rapidly and inexpensively.

So far as we have been able to discover, there is no effect on the carbide. Photomicrographs of the material immediately surrounding the work area show no change in chemical makeup or in grain size. And such intricate parts as punches for razor blade dies (next page) are made by this method, chopping the piece out of a solid block, and then it can be put to use without the necessity of removing more than a fraction of a thousandth of an inch. If it will withstand that sort of service in punching sheet razor blade material. I am sure the process has not deteriorated the metal in any way.

This process should be distinguished from disintegration which requires metal to make contact between the work and the arc electrode. The temperature of this electric arc is sufficient to volatilize this metal, to decompose any metallic compounds and actually destroy it.

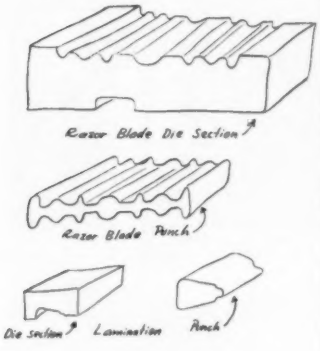
That is quite different from Method X, which involves no temper-

ature rise of any degree in the material.

QUESTION: While there is a secrecy order on Method X, suppose we asked your company to make carbide parts for a die. Would they go ahead and use that process in making the parts?

JUDKINS: Surely. There is no limitation whatsoever on the use of the equipment in our own plant and any work that you send the company by blueprint and pieces to be formed will be done on the basis of a firm quoted price and the parts returned to you in their finished condition. The secrecy order relates to disclosure of the method which is used.

PRESIDENT JAHN: I would like to ask a question about razor blade



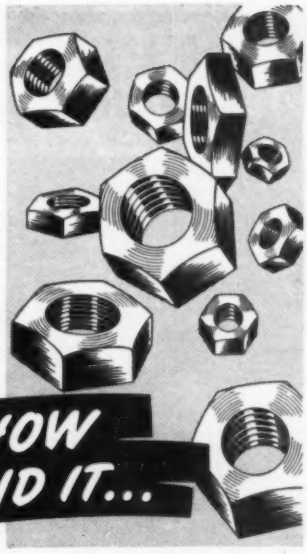
dies. I presume that is a Gillette die. There is another part that goes into the construction of that tool that takes either a 45° angle or 60° angle, I have forgotten which, right out to a knife edge. The edge has to be very, very sharp because in the process of razor blade manufacture these razor blades are broken off between those two blades. I want to know whether or not the carbide people have ever been successful in making a carbide which was suitable for a punch of that kind, and if not, if they ever expect to be able to. I maintain up to this point they have never been successful with a carbide where a punch would go out to a knife edge and stand up.

JUDKINS: I don't think there is a carbide today which will operate under those conditions of a dead sharp, acute angle punch. Whether one can be developed, I frankly don't know. We would be very happy if we could produce one, and I am sure the other producers would also, but that is asking a lot. Remember when the National Series of Threads were devised? They were planned with two reasons in mind: First, that the weakening of the bolt shank would be such that half the time the thread would strip and half the time the bolt would break through tension.

Another thing, the National Series

FROM 25-125 erratic threaded holes per tap

TO 22,000 clean class 3 threaded holes per tap



HERE'S HOW HY-PRO DID IT...

PART: 18-8 stainless steel hex nut with *punched hole*

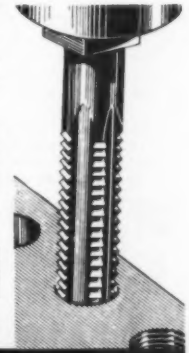
PROBLEM: Tapping with a 10-24 tap, a leading nut manufacturer experienced difficulty holding size and was troubled with excessive tap breakage.

Then They Called in the HY-PRO Sales Engineer

HY-PRO SOLUTION: His recommendation was a standard Hy-Pro 10-24 machine screw tap with one of the exclusive Hy-Pro surface treatments for wear and lubrication. Speed and cutting oil were adopted from extensive tables in Hy-Pro catalog. Production with Hy-Pro taps now averages 22,000 burr-free *Class 3* threaded holes at 62 nuts per minute.

Above is a typical example of how the Hy-Pro Sales Engineer can help increase threaded-hole production. His expert engineering counsel backed by the most up-to-date tap production methods combine to solve tapping problems rapidly and profitably.

All Hy-Pro Taps are ground from tough uniform quality high-speed steel and given one of the Hy-Pro exclusive surface treatments.



Each tap is completely inspected by the latest electronic quality control equipment, your assurance that there will be no dimensional variance in Hy-Pro Taps of a stated size.

These precision manufacturing methods plus the ability of the Hy-Pro Sales Engineer to prescribe the correct tap for your particular job means *sustained accuracy* on your production line resulting in higher productivity from your tapping machines.

℞ Let Hy-Pro solve your tapping problem—call a Hy-Pro Sales Engineer today.

Order from your distributor.

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HY-PRO TOOL CO.

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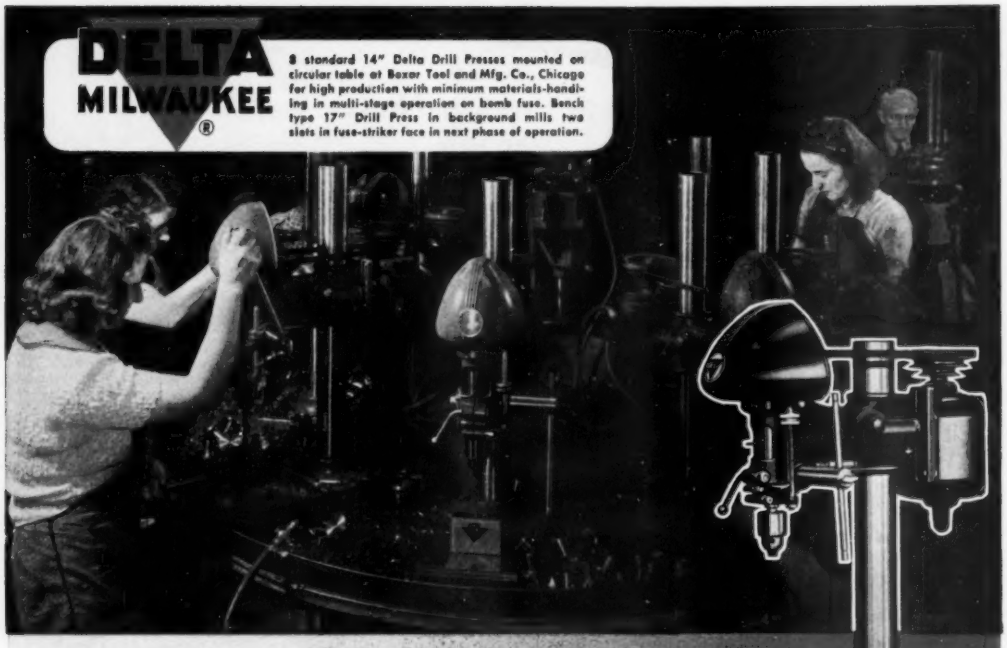
8 standard 14" Delta Drill Presses mounted on circular table at Boxer Tool and Mfg. Co., Chicago for high production with minimum materials-handling in multi-stage operation on bomb fuse. Bench type 17" Drill Press in background mills two slots in fuse-striker face in next phase of operation.



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Remember to count on Delta to solve your own drilling problems. A little ingenuity gives you a quick, low-cost solution to meet production's critical standards and rugged schedules.

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Complete selection to meet every need—with the right capacity, the right speed—in floor and bench types . . . single spindles, multi-spindle batteries, individual heads for special set-ups . . . power-feed or foot-feed—and a complete line of accessories for every model. The same selection in 17" drill presses. All told, 144 different models at prices from $77.50 to $2,892.50.

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☐ Catalogs and bulletins on complete Delta line.

Name.....
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of Threads is not sharp V. There is a flat at the root and the crest of the thread equal to one-eighth linear pitch. That was decided because it was admitted no known tool material would take and retain a dead point, even on a 60° angle. If it did, it would quickly wear off.

PRESIDENT JAHN: I would like to ask one other question. We have had some discussion here about putting threads in carbide. Are you fellows of the opinion that if you do successfully put a thread in carbide that a commercially purchased screw will not break that thread away?

JUDKINS: We recently made a die ring for one of the automobile people that was about 17-in. OD, a little over 1 in. thick and 1½-in. wall. That is a pretty big hunk of carbide. It became necessary to secure it to the punch ram.

Various methods were discussed. We finally did it by tapping in 10⅝ inch, 16, National Coarse Class 2, ⅝ inch deep holes on a suitable bolt circle and securing the ring to the supporting structure by means of commercial screws and it has not failed in service.

PRESIDENT JAHN: In other words, you feel that a commercial screw tightened will not break the carbide.

JUDKINS: If it is class 2 screw, it shouldn't break the carbide because the thread in the carbide will be a class 2 fit.

QUESTION: Getting away from razor blades and back to carbides, does your company contemplate licensing someone else to use Method X to make tools, and so forth?

JUDKINS: There is no intent on the part of our company to withhold this from industry. Any restrictions that have been imposed were imposed by the United States Government, not ourselves. It was our intent before the secrecy order was transmitted to make it available to anyone who wished to use it. Our thinking hadn't proceeded to the point where we knew whether we were going to lease the equipment or sell it outright, but there certainly was no intent to keep others from using it. Quite the contrary—we wanted everyone to have the use of it, and I am sure that will utimately work out.

QUESTION: On this Method X, how close a tolerance can you hold? How close to the finish can you come with this process in preforming? Assume you are not going to produce a finished part, just a pre-finished part.

JUDKINS: The clearance between the working electrode and the result-

BE PREPARED FOR ALL OUT PRODUCTION

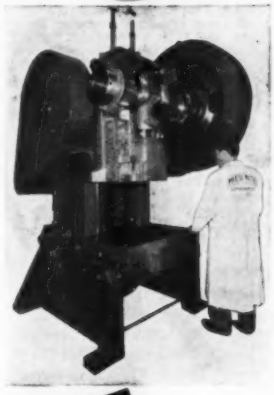
WITH THE

85 TON POWER PRESS

OPEN BACK • INCLINABLE

Featuring...

NEW FRAME DESIGN* WITH BUILT IN TIE RODS FOR GREATER STRENGTH



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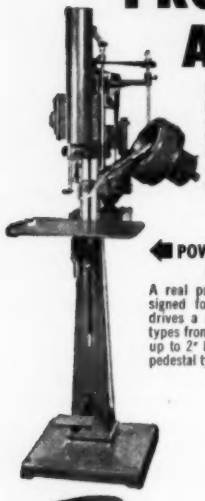
INDUSTRIAL SPEED-UP

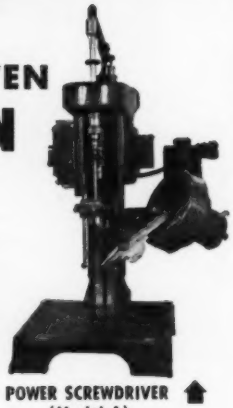
demands these POWER-DRIVEN PRODUCTION AIDS . . .

Now, more than ever, speed in production is the order of the day . . . That's why these popular D.P.S. power-driven machines prove a greater-than-ever contribution to present-day industrial needs.



POWER SCREWDRIVER (Model B)

A real production machine designed for constant service. It drives a range of screws of all types from No. 6 to ¼" diameter, up to 2" length. Both bench and pedestal types.

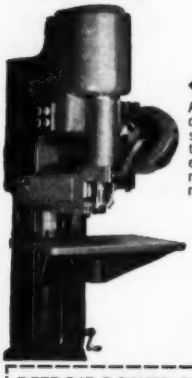


POWER SCREWDRIVER (Model A)

A sensitive but sturdy machine for driving small screws in delicate assemblies. Capacity, No. 2 to No. 6 screws. Both bench and pedestal types. Designed for maximum service, easy operation and speed. All screws driven to uniform tension. Will not strip threads or mar heads.

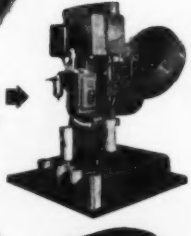
THE HOPPER UNIT

Motorized—Highly Adaptable—A selective feeding device whereby production parts are selected, oriented and fed in a given position for primary and secondary operations.



NUT DRIVER

A revolutionary new machine that drives nuts with amazing speed, either semi-automatically, or it can be adapted to full automatic operation entirely eliminating the manual handling of nuts. Capacity: nuts, 3/16" min. to 11/16" max. across flats.



SPECIAL ASSEMBLING MACHINES

For light assembly operations using Hopper Units to feed component parts.

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BY_____

STREET ADDRESS_____

CITY_____ STATE_____

SEND SAMPLE ASSEMBLY for PRODUCTION ESTIMATE

DETROIT POWER SCREWDRIVER CO.

ing opening in the work in case of an internal aperture can be as little as 0.002 in. on the diameter. In other words, there must be a clearance of at least 0.001 in. between the tool, if you wish to call it a tool, and the hole that it produces.

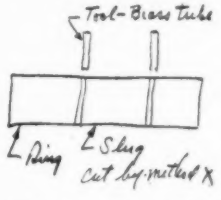
As far as accuracy of roundness, as far as accuracy of spacing, center to center distance between openings in the same piece of carbide, it is quite feasible to hold a tolerance of less than a thousandth. It is not intended that the pieces produced by this process will be used without further surface refinements. It may be necessary to lap off as much as a thousandth of an inch, which shouldn't be much of a hardship.

QUESTION: How expensive is the process?

JUDKINS: It depends entirely on the intricacy of the opening or the internal shaping.

QUESTION: Could you give us a rough idea how much one of these punches you have drawn over there would cost?

JUDKINS: I can tell you this: The cost of putting through a threaded hole, say one ⅜ in., 16, National Coarse Class 2, to a depth of ⅝ in., such as the example I described, is about $8 to $10 per hole; in a very large die ring that would be a fairly



tolerable price. The cost is largely dependent upon the intricacy of the opening. Anything you can produce in brass you can produce in carbide by this method. If you want a splined hole, such as you might need for a compacting die for a powdered metal sintered gear, it is quite possible to purchase the right kind of extruded brass stock commercially and to use that as your tool. To make a large opening, as was previously mentioned, you use a tube and you save the slug. In other words, it is not a boring or drilling operation; it is really a trepanning operation because the OD of the tube produces the hole and the ID of the hole produces the slug which falls out, which can be used as a guide pin or whatever you wish.

QUESTION: I would like to ask Herb Harig a question. He gave us the ratio of 10 to 1 on production increases with carbide dies. What do you find the approximate cost in-

(*Continued on p. 206*)

subcontracting NEWS

EXHIBIT OF PARTS which will be subcontracted by 27 prime contractors for the Air Force drew almost 4000 manufacturers from New York area to office of New York Air Force Procurement District. Here F. W. Moore, manager of procurement, Propeller Div., Curtiss-Wright Corp., discusses a production problem with James V. Serio of Dunkirk Die & Machine Works

4000 Small Manufacturers Meet With Prime Contractors at Air Force Exhibit

NEW YORK—Approximately 4000 potential subcontractors from this metropolitan area took advantage of the Air Materiel Command's invitation to meet with 27 prime contractors here Feb. 19-23 at the New York Air Force Procurement field office.

The local manufacturers examined displays of parts for instruments, electronic equipment, air frames, motors, aerial cameras, and other items for which subcontractors are sought. In all, the 27 prime contractors who participated in the exhibit have approximately 300 contracts valued at more than $250 million.

Below is indicated types of items on which subcontracts will be let, with facilities and experience which the potential subcontract should have to work on the Air Force jobs held by the 27 manufacturers.

Bendix Radio Division

Facilities for aircraft radio and radar equipment are being sought by Bendix Radio Div., Bendix Aviation Corp., Towson, Md. To date the firm has let more than $22 million in subcontracts. Contact: Robert E. Wine, manager of subcontracting.

Curtiss-Wright Corp.

The Propellor Div., Caldwell, N. J., wants subcontractors who can do precision machine work in experimental and production quantities on alloy steel and magnesium parts. The Electronics Div. at Caldwell wants subcontractors for work on generator motors, servo motors, thermo relays, transformers, and small precision type controls. Contact: F. W. Moore, manager of procurement.

Cameraflex Corp., New York

The subcontractor with a high-class machine shop, including profilers, engraving machinery, milling machines, and lathes, can obtain work on such camera parts as shutters, gages, housings. Contact: H. R. Kassman, subcontractor relations.

Eastern Rotocraft Co.

Cargo tie-down devices are being subcontracted by this Hatboro, Pa., manufacturer, who seeks machine shops equipped with lathes, milling machines, drilling machines. Also sought are plants equipped to do aluminum casting and steel drop forging.

Farrand Optical Co.

This Bronx, N. Y., firm is working on gun sights and bomb sights for the Air Force, and is seeking subcontractors with high class machine shops for work on coil winders, anodyzing, plating. Also sought are optical shops, plastic firms with metalizing facilities, and manufacturers equipped to do high-vacuum coating. Contact: Carl Neitzel, purchasing agent.

Kearfott Engineering Co., Inc.

Air Force contracts to make vertical gyros and gyro compasses are held by this New York firm. Subcontractors with investment casting facilities are sought.

Lavoie Laboratories

Directional beam range systems, test equipment, and radio and radar items are being manufactured by Lavoie at Morganville, N. J. Machine shops with tool & die, and production assembly facilities, are wanted. Contact Eugene Lavoie, in charge of subcontracting.

Glenn L. Martin

With several millions of dollars in orders for B51's and other aircraft, Martin at Baltimore is looking for sheet metal firms and machine shops for work on stabilizers, wing tips, struts, floats and other aircraft parts. Contact P. T. Rossi, manager of subcontracting.

(Continued next page)

Chrysler to Build Tank Engines at New Orleans

DETROIT—Chrysler Corp. has been awarded a $100-million contract to build tank engines, and an additional $30 million for facilities. The engines will be built at Chrysler's Michaud plant, New Orleans. Considerable subcontracting will be let on the job. Criteria for selection of subcontractors will be price, ability to make deliveries, and quality. The award is for the Continental Motors engine, which is standard for tanks; Chrysler is making it on license. In charge of the program: R. S. Bright, general manager, Michaud Tank Engine Plant, Chrysler Div., New Orleans, La.

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. . . continued

AF Manufacturers Make Known Their Subcontracting Needs

W. L. Maxson Corp., New York

For subcontracting work on transformers, coils, and motors of one hp and up, this manufacturer of fire-control instruments and radio items for the armed forces needs plants with equipment for general machining, metalforming, and sand casting. Contact: Charles K. Craggs, subcontract manager.

Philco Corp., Philadelphia

Air Force contracts for a variety of electronic items being produced at Philadelphia can be speeded if qualified subcontractors can be obtained for such items as transformers, capacitors, resistors, plugs and jacks, bolts, nuts, screws, copper piping, small machine parts, forgings, castings, and sheet metal work. Contact: W. MacMurtrie, general purchasing agent.

Piasecki Helicopter Corp.

For its dual rotor helicopters being built at Morton, Pa., Piasecki wants subcontractors who can do machine work, castings, forgings, and gear work. Contact: R. W. Mattox, manager of subcontracting.

Reeves Instrument Co., New York

Ability to work at close tolerances is a major consideration of Reeves in selecting subcontractors. The firm is looking for manufacturers with equipment such as milling machines, grinders, thread grinders, engine lathes. Contact: Edward Garrett, manufacturing superintendent.

Sikorsky Aircraft Corp.

This United Aircraft division at Bridgeport, Conn., is looking for machine shops with specialized equipment. Contact: J. M. Lemon, in charge of subcontracting.

Weston Electric Instrument Corp.

This Newark, N. J., manufacturer wants subcontractors who can handle precision work, with very close tolerances. Equipment a shop would need includes automatic screw machines, drilling machines, boring machines. Contact J. M. Williams or D. Magee, in charge of subcontracts.

Army, Navy Plan No Meetings

WASHINGTON—The Army and the Navy are not planning to follow the lead of the Air Force's New York procurement office in bringing together prime and subcontractors. Navy procurement heads say they don't have to do anything to encourage the subcontractors. Army Ordnance, however, has had on display at Detroit arsenal for some time a group of items on which subcontracts are let—gears, parts of transmissions, pressed metal parts, etc.

DEFENSE CONTRACTS...

WASHINGTON—Following is the latest list of major prime contracts in metalworking, as awarded by the Army, Navy, and Air Force, and announced by the Department of Commerce. To meet production schedules for these contracts, many of the manufacturers named will have to parcel out parts of the bigger jobs to subcontractors. If you're interested, contact the prime contractor named.

ARMY ORDNANCE AWARDS

Standard Motor Products, Inc., Long Island City, N. Y., coils, $110,517.

Jefferson Engr. & Mfg. Co., Detroit, shafts, $115,305.

Allis Chalmers Mfg. Co., Milwaukee, pipe, line, pinion, $191,191; shims, shroud spacer, $714,474; nuts, nuts, strip, stud, $470,187.

Lakeview Forge Co., Erie, Pa., yokes, $99,038.

Chevrolet Div., General Motors Corp., Detroit, platform trucks, 892,659; pickup trucks, $379,046; trucks, $979,979; heaters and defrosters, $15,959,252.

Tobin-Arp Mfg. Co., Minneapolis, bars, $126,686.

Oldberg Mfg. Co., Grand Haven, Mich., mufflers, $120,790.

Big Jet Engine Contract Awarded to Chevrolet

DETROIT—Chevrolet Motors has received a contract to manufacture jet engines in a government-owned plant at Tonawanda, near Buffalo, N. Y. Work will begin immediately on extensive tooling and development of production machines to reactivate the plant, adjoining the Chevrolet factory at Tonawanda. Production is scheduled for 1952.

Size of the project was not disclosed in dollar or unit terms, but parts will be subcontracted. Final decision hasn't been made as to which jet engine would be manufactured. The contract is the biggest single military job ever awarded Chevrolet.

Willys-Overland Motors, Inc., Toledo, cylinders, $113,588.

Lempco Products, Inc., Bedford, Ohio, lathes, brake drum, $203,655.

Barrett Equipment Co., St. Louis, lathes, brake drum, $156,660.

Food Machinery & Chemical Co., San Jose, Calif., conduits, covers, clamp, etc., $130,818; springs, wedge, $104,277; retainers, ends, $258,207.

Chas. A. Strelinger Co., Detroit, grinders, $144,500.

Knorr-Maynard, Inc., Detroit, governors, $119,190.

Cuno Engineering Corp., Meriden, Conn., filters, $171,820.

Hart Hydraulics, Inc., Detroit, flange & cone, $235,756.

Scovill Mfg. Co., Brooklyn, N. Y., valves, sleeve, $168,041.

Do-All Detroit Co., Detroit band saws, $163,500.

Studebaker Corp., South Bend, Ind., cargo trucks, $12,380,000.

Western Gear Works, Seattle, Wash., gears, $151,102.

Warner Electric Brake & Clutch Co., Beloit, Wis., sockets, $136,873.

Lally's Co., Des Moines, Iowa, carburetors, kits, $602,500.

Triplex Corp. of America, Pueblo, Colo., pistons, $119,000.

International Harvester Co., Chicago, trucks, $8,000,000.

GMC Truck & Coach Div., General Motors Corp., Pontiac, Mich., trucks, $30,000,000.

Nelsonville Foundry & Machinery Co., Nelsonville, Ohio, wheels, $2,338,746.

(*Continued on next page*)

ORDNANCE AWARDS ... continued

Reo Motors, Inc., Lansing, Mich., trucks, gas tanks, $11,557,528.

Federal Motor Trucks Co., Detroit, trucks, $3,090,446.

Northwestern Auto Parts Co., Minneapolis, wheels, $568,588.

Cadillac Motor Car Div., General Motors Corp., Detroit, mid-range motor carriages plus spare parts, $35,000,000.

Fruehauf Trailer Co., Detroit, roller shackle, $188,928.

Mack Mfg. Co., Plainfield, N. J., screws, plug, case, $368,885.

Ford Motor Co., Dearborn, Mich., buses, $7,255,954; trucks, $5,734,738; trucks, $18,515,441.

McCord Corp., Detroit, radiators, $269,100.

Guaranteed Parts Co., Seneca Falls, N. Y., point sets, $97,500.

Buick Motor Div., General Motors Corp., Detroit, automobiles, $229,591.

R. K. LeBlond Machine Tool Co., Cincinnati, engine lathes, $98,618.

Westinghouse Air Brake Co., Wilmerding, Pa., compressors, $340,445.

Oldsmobile Div., General Motors Corp., Lansing, Mich., assemblies for 3.5-in. rockets, facilities, $4,580,000.

Kropp Forge Ordnance Co., Melvindale, Mich., facilities for production of steel forgings, $2,038,445.

Muncie Gear Works, Inc., Muncie, Ind., parts for 60mm and 81mm mortars, special tooling, $244,879.

Premier Textile Machinery Co., Jersey City, N. J., parts for 81mm mortar, special tooling, $105,290.

La Pointe Machine Tool Co., Hudson, Mass., broaches, fixtures, pullers, tooling & machines, $212,269.

Newcomb Spring Co., Brooklyn, N. Y., spring operating, $100,500.

Ex-Cell-O Corp., Detroit, springs, washer, back plate buffer group assembly, $105,750.

Henry A. Knott, Inc., Baltimore, extension of transonic range, $129,771.

Graflex, Inc., Rochester, N. Y., M34 sight units with spare parts, $815,064.

Weber Machine Corp., Rochester, N. Y., telescope mounts, with equipment, $124,050.

Remington Arms Co., Inc., Bridgeport, Conn., ball cartridges, .22-cal, Hornet, soft point, $3,613,032; ball cartridges, .30-cal carbine, $114,080.

Universal Camera Corp., New York, erector assembly and spare parts, $101,140.

U. S. Rubber Co., New York, cable assembly and spare parts, $796,532.

Mergenthaler Linotype Co., Brooklyn, periscopes and spare parts, $750,000.

Winchester Repeating Arms Co., New Haven, Conn., ball cartridges, .30-cal., $1,000,000.

Gilbert & Barker Mfg. Co., West Springfield, Mass., spare parts for fuse setter & tooling, $100,000.

Argus, Inc., Ann Arbor, Mich., sights, reflex, M18 & spare parts, $500,000.

Northern Engraving & Mfg. Co., La Crosse, Wis., 20mm cartridge cases, $300,050.

ARMY SIGNAL CORPS AWARDS

Cooper & Cooper, Chicago, tool equipment, $267,761.

Leeds & Northrup Co., Philadelphia, radiosonde recorders, $250,000.

Radio Corp. of America, Camden, N. J., radio sets and maintenance parts, $2,000,000.

Lavoie Laboratories. Morganville, N. J., test equipment, $140,000.

Munston Mfg. Co., New York, test equipment, $110,000.

Barber & Williamson, Inc., Upper Darby, Pa., radio sets, $180,000.

P. W. Mallery, Philadelphia, power supply, $250,000.

Park Mfg. Co., Grant Park, Ill., power supply, $250,000.

Manufacturer's Battery Co., Madison, Wis., batteries, $248,100.

Westinghouse Electric Co., Philadelphia, industrial preparedness study on electrical indicating instruments, $483,370.

Automatic Radio Mfg., Inc., Boston, auxiliary interphone equipment, $496,764.

General Electric Co., Syracuse, N. Y., detector sets and parts, $1,500,000.

National Carbon Div., Union Carbide & Carbon Co., New York, batteries, $479,115.

Simplex Wire & Cable Co., Cambridge, Mass., cable assembly, $200,000.

Western Electric Co., Inc., New York, cable assembly, $900,000.

United States Rubber Co., New York, cable assembly, $150,000.

General Cable Corp., Philadelphia, cable assembly, $1,250,000.

QUARTERMASTER AWARDS

Paterson Oven Co., Franklin Park, Ill., trailer, oven, mobile bakery, and parts, $290,205.

American Machine & Foundry Co., New York, trailer, oven, mobile bakery, and parts, $560,277.

Jones & Laughlin Steel Corp., Pittsburgh, steel, sheets, cold rolled, $94,005.

Griffin Mfg. Co., Dallas, clusters, incendiary bomb (components only), $4,690,410.

Bethlehem Steel, Bethlehem, Pa., steel, sheets, cold rolled, $96,720.

Armco Steel Corp., Littletown, Ohio, steel, sheets, cold rolled, $123,427.

Atlanta Metallic Casket Co., Atlanta, Ga., metal burial caskets, $117,485.

United States Steel Co., Chicago, steel, sheets, cold rolled, $131,847.

Republic Steel Corp., Cleveland steel, sheets, cold rolled, $137,564.

(Continued on page 200)

B. C. Gets 50 Million in Canadian Defense Contracts

VANCOUVER, B. C. — Defense contracts valued at close to $50 million have been let, or are in the process of being let in British Columbia since Canada's rearmament program got under way. Largest individual contract has been placed in the shipbuilding industry with orders for two super-destroyers at about $9 million each. Orders are placed by Canada's Department of National Defense through Canadian Commercial Corporation, government purchasing agent.

It is not expected that the large aircraft production which developed in Vancouver in World War II will be resumed in connection with the present defense program.

Packard Will Build Newly Developed Diesel Engines for Navy

DETROIT—Packard Motor Car Co. has announced $20 million in Navy contracts for production of a newly developed family of diesel engines. The new engines, of 6, 8, 12, and 16 cylinders, will be built at Packard's Detroit plant.

According to Packard president Hugh J. Ferry, the new design called for "the most powerful marine diesel engine per pound of weight" now in production. The company is now tooling up, and several thousand additional workers will be hired.

Output of the engine group ranges up to 800 hp for the 16-cyl unit. The engines will be made of light metal.

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QUARTERMASTER AWARDS

. . . continued

Superior Sleeprite Corp., Chicago, folding cots, steel, $299,810.

Breeze Burners, Inc., Santa Fe, New Mexico, oil burner tent stoves, $385,650.

Wheeling Corrugating Co., Wheeling, W. Va., tent stoves, $617,057.

Crawford-Austin Mfg. Co., Waco, Tex., folding cots, steel, $206,830.

Rheem Mfg. Co., Southgate, Calif., 5-gal. gasoline cans, $3,034,500.

Russakov Can Co., Chicago, 5-gal. gasoline cans, $1,582,600.

Nesco, Inc., Milwaukee, 5-gal. gasoline cans, $1,995,000.

Bennett Industries, Pectone, Ill., 5-gal. gasoline cans, $551,633.

Geuder, Peschke & Frey Co., Milwaukee, 5-gal. gasoline cans, $548,700.

Conce Engineering Works Div., H. D. Conkey & Co., Mendota, Ill., 5-gal. gasoline cans, $1,417,500.

CORPS OF ENGINEERS AWARDS

Joy Mfg. Co., Chicago, air compressors, $800,000.

Davey Compressor Co., Kent, Ohio, air compressors, $1,000,000.

Worthington Pump & Machinery Co., Chicago, air compressors, $100,000.

Minneapolis-Moline Co., Minneapolis, tractors, $150,000.

Northwestern Steel & Wire Co., Sterling, Ill., nails, wire, steel, $175,000.

Jones & Laughlin Steel, Pittsburgh, nails, wire, steel, $100,000.

Bethlehem Steel Co., Bethlehem, Pa., steel, plate, boiler, $140,000.

Ceco Steel Products Co., Chicago, panels, $800,000.

American Bridge Co., Chicago, frame, bracing, $1,000,000.

Pittsburgh-Des Moines Steel Co., Pittsburgh, ramp, button, $600,000.

International Steel Co., Evansville, Ind., panels, $500,000; sway braces and transom clamps, $650,000.

Commercial Shearing & Stamping Co., Youngstown, Ohio, frame, bracing, $1,000,000; sway braces, capsills, clamps, guardrail ribands, $200,000.

Ralph B. Carter Co., Hackensack, N. J., pumps, $180,000.

Decatur Iron & Steel Co., Decatur, Ala., Bailey bridge, components, $125,000.

Ford Motor Truck Co., Dearborn, Mich., 2-door sedans and ½-ton trucks, $150,000.

Southwest Welding Co., Alhambra, Calif., scrapers, $300,000.

Steel Products Co., Savannah, Ga., trailers, $425,000.

Subcontracting News from Cleveland

Defense Contract Conference Attracts 500 Companies

CLEVELAND—Approximately 1000 persons representing about 500 different companies in northern Ohio attended the Ohio Manufacturer's Defense Contract Conference held here Feb. 20. Aim of the conference was to educate small and large metalworking companies on how to proceed in getting defense contracts, both as prime and secondary contractors. Representatives from other cities were in Cleveland for a close-up of the conference, since plans for similar gatherings are being formulated in other industrial centers.

Cleveland Pneumatic Tool Has Backlog of Orders

With a big backlog of defense orders, Cleveland Pneumatic Tool Co. is subcontracting component parts, using from 75 to 100 subcontractors, most of them located within 100 miles. In charge of subcontracting: W. A. Owen, general purchasing agent.

Warner & Swasey Sends Out Call for Subcontractors

Warner & Swasey Co. has been advertising in newspapers for subcontractors with machine shop capacity. One specific request: 500 turret lathe hours per month or greater. Also wanted is complete manufacturing and assembly capacity for machine units. W&S furnishes material and priority. In charge of the subcontracting program: C. T. Blake.

$11.7 Million Munitions Award to Lempco Products

Lempco Products Co. has been awarded a munitions contract totaling $11.7 million but which can be expanded into a $30 million contract overnight. To fill the present contract, which is classified as to exact products, Lempco will spend approximately $2.5 million for new machine tools made by other companies. J. J. Strnad, vice president, is in charge of filling the new government contract.

Rogers Bros. Corp., Albion, Pa., trailers, $900,000; spare parts, $925,000.

R. G. LeTourneau, Peoria, Ill., tractors, $3,600,000; scrapers, $600,000.

Buda Co., Harvey, Ill., generators, $1,000,000.

Hill Diesel Engine Co., Lansing, Mich., generators, $700,000.

Ready-Power Co., Detroit, generators, $1,600,000.

Consolidated Diesel Electric Corp., Stamford, Conn., generators, $740,000.

Stewart & Stevenson Services, Dallas, generators, $300,000.

Norris Stamping & Mfg. Co., Compressed Gas Cylinder Div., Los Angeles, cylinders, $100,000.

Bay City Shovel, Inc., Bay City, Mich., crane shovels, $1,000,000.

Calion Iron Works, Calion, Ohio, road rollers, $600,000.

John Reiner Co., Long Island City, pumps, $95,000.

NAVY AVIATION AWARDS

AiResearch Mfg. Co., Los Angeles, thermostats, oil valves for aircraft, $11,266.

American Smelting & Refining Co., New York, copper ingots, $99,000.

General Laboratory Associates, Inc., Norwich, N. Y., ignition units for jet engines, $274,015.

Rochester Products Div., General Motors Corp., Rochester, N. Y., regulator assembly, automatic manifold pressure for aircraft, $118,510.

West Hydraulics Ltd., North Hollywood, Calif., valves, hydraulic selector for aircraft, $156,140.

General Cable Corp., Philadelphia, cable, telephone, for shipboard use, $212,760.

General Electric Co., Schenectady, N. Y., generators, $923,596; trailer-mounted engine driven aircraft energizers, $520,000.

BUREAU OF SHIPS AWARDS

Gibbs Corp., Jacksonville, Fla., construction of two 165-ft minesweepers, $3,000,000.

Astoria Marine Construction Co., Astoria, Ore., construction of two 165-ft minesweepers, $3,000,000.

Luders Marine Construction Co., Inc., Stamford, Conn., construction of three 165-ft minesweepers, $4,500,000.

Fulton Shipyard, Antioch, Calif., construction of two 165-ft minesweepers, $3,000,000.

C. Hiltebrant Dry Dock Co., Kingston N. Y., construction of two 165-ft minesweepers, $3,000,000.

Westinghouse Electric Corp., Washington, D. C., turbine generator sets, $400,000; searchlights, 24-in. nonmagnetic, $187,150.

Foster Wheeler Corp., New York, boilers, $300,000.

Stewart-Warner Corp., Electric Div., Chicago, direction finders, $800,000.

Continental Aviation & Engineering Corp., Detroit, design, construct, test & furnish BHP prototype diesel engines, $1,000,000.

OTHER NAVY AWARDS

United States Steel Co., Washington, D. C., steel, hull, plates, $99,414.

Monarch Machine Tool Co., Sidney, Ohio, lathes, toolroom, motor driven, $105,948.

Eastern Stainless Steel Corp., Baltimore, steel, stainless, sheets, strips, etc., $97,185.

Finnell System, Inc., Elkhart, Ind., machines, electric floor polishing, $120,505.

Clark Equipment Co., Buchanan, Mich., tractors, warehouse & trucks-fork lift, $366,527; gasoline fork trucks, $2,215,546.

Tocco Div., Ohio Crankshaft Co., Cleveland, Budd 10x24 induction hardening machinery and equipment, $138,276.

American Metal Co., Ltd., New York, bar silver, $180,540.

Hall-Scott Motor Div., ACF Brill Motors Co., Phildaelphia, repair parts for gasoline engines, $478,768.

Hytron Radio & Electric Corp., Salem, Mass., electron tubes, $175,000.

Teletype Corp., Chicago, teletype parts, $254,217.

General Electric Co., Wire & Cable Div., Bridgeport, Conn., cable, electric, interior communication, heat & flame resistant, $129,381.

Capital Airlines, Washington, D. C., Pratt & Whitney engines, $1,224,000.

B. G. Corp., New York, spark plugs for various aircraft, $404,538.

Lukens Steel Co., Coatesville, Pa., steel, special treatment, $172,910.

Fred T. Ueltzen, Century Tool Co., Philadelphia, pliers, lineman's cutting, $111,591.

City Electric & Fixture Co. & Morrison-Knudsen Co., Seattle, steel towers at U. S. Naval Radio Station, Arlington, Wash., $1,088,605.

Raytheon Mfg. Co., Waltham, Mass., electron tubes, $822,150.

Dravo Corp., Philadelphia, various repair parts for centrifugal pumps, $605,068.

Buda Co., Harvey, Ill., various repair parts for diesel engines, $413,905.

Detroit Diesel Engine Div., General Motors Corp., repair parts for diesel engines, $140,700.

American Hoist & Derrick Co., St. Paul, Minn., railway cranes, $468,294.

Austin-Western Co., Aurora, Ill.,, road graders, $2,255,460.

Stran Steel Div., Great Lakes Steel Corp., Detroit, buildings, $5,973,780.

Pioneering Engineering Works, Inc., Minneapolis, construction equipment, $450,304.

AIR FORCE AWARDS

Royal Electric, Inc., Jamestown, Ohio, investors, $435,632.

Gaveco Labs, Inc., New York, exciter regulators, $107,856.

Jack & Heintz Precision Industries, Inc., Cleveland, inverters, $229,487; starters, $228,322.

Hammarlund Mfg. Co., Inc., New York, receivers, $259,505.

Clark Equipment Co., Washington, D.C., fork trucks, gas, $261,907.

(Continued next page)

Arizona Booms As Aircraft Center

PHOENIX—Arizona jumped into the aircraft parts manufacturing and proving grounds fields in early February. In rapid succession came:

The decision of Hughes Aircraft Co. to construct a $9 million guided missiles plant at Tucson, with a maximum work force of 8000.

The Air Force announcement that Fort Huachuca, military base near the Mexican border, would be used as a guided missile and aerial research testing ground.

Garrett Corp. started work on a $600,000 AiResearch plant at Phoenix and will have 250,000 sq ft under roof at a site adjoining Sky Harbor, municipal airport. The firm will produce precision apparatus for aircraft.

And the American Helicopter Co. of Manhattan Beach, Calif., took over a portion of Falcon Field, near Mesa, for experimentation on a jet pulse helicopter.

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AIR FORCE AWARDS . . . continued

Consolidated-Vultee Aircraft Corp., Ft. Worth, Tex., kits and misc. modernization modification parts for aircraft, $100,000; mobile training units, $118,638.

Cleveland Steel Barrel Co., Cleveland, cylindrical steel drums, $740,000.

Kearney & Trecker Corp., Milwaukee, milling machines, plain, dual power, $102,624.

Snap-On Tools Corp., Kenosha, Wis., wrench-crowfoot, thin ⅜-in square drive, $176,435.

Plomb Tool Co., Los Angeles, wrenches-crowfoot, $168,645.

Sargent & Co., Schollhorn Div., New Haven, Conn., pliers, side cutting, parallel jaws, $166,960.

Bethlehem Pacific Coast Steel Corp., San Francisco, steel, angles, $112,988.

Acme Steel Co., Chicago, kits, box, strapping, $187,140.

Gould-National Battery Co., Depew, N. Y., aircraft batteries, $314,952.

Lockheed Aircraft Corp., Burbank, Calif., aircraft, $14,000,000.

B. F. Goodrich Co., Akron, Ohio, wheel & brake assemblies, $341,462; wheel assemblies, $355,000.

Goodyear Tire & Rubber Co., Akron, wheel & brake assemblies, $2,502,551; wheel assemblies, $198,242.

Bendix Products Div., Bendix Aviation Corp., South Bend, Ind., wheel & brake assemblies, $1,849,885; carburetor spare parts and fuel injection spare parts for aircraft, $875,378.

Emerson Radio & Phonograph Corp., New York, glide path receivers, $869,817.

Scintilla Magneto Div., Bendix Aviation Corp., Sidney, N. Y., engine ignition analyzers, $202,226.

General Electric Co., Schenectady, N. Y., aircraft generators, $1,146,010; spare nozzleboxes, $902,428.

Republic Aviation Corp., Farmingdale, L. I., New York, kits & modernization modification parts for assemblies and subassemblies for aircraft, $100,000; spare parts, $550,000.

North American Aviation, Inc., Los Angeles, wing tanks, $1,000,000; aircraft spare parts, $4,821,273; misc. assemblies & subassemblies, $100,000; model airplanes and related equipment, $7,749,458.

Pacific Mercury Television Mfg. Corp., Van Nuys, Calif., glide path receivers, $731,105.

AVCO Mfg. Corp., Cincinnati, glide path receivers, $1,244,269.

Grand Central Aircraft Co., Glendale, Calif., reconditioning of aircraft, $19,220,000; repair & overhaul of aircraft items, $2,835,000.

Union Switch & Signal Co., Swissvale, Pa., bomb tails, $1,000,000.

Fairchild Camera & Instrument Corp., Jamaica, N. Y., echo boxes, $297,574.

Curtiss-Wright Corp., Propeller Div., Caldwell, N. J., propeller assemblies, $984,872.

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J., inverters, $470,910.

Western Electric Co., New York, test indicators, $106,406.

Solar Aircraft Co., San Diego, maintenance spare parts for aircraft, $270,980.

Cleveland Pneumatic Tool Co., San Diego, misc. spare parts for aircraft, $130,000.

Allison Div., General Motors Corp., Indianapolis, engine parts, $458,856.

Sperry Gyroscope Co., Great Neck, Long Island, N. Y., automatic pilot components, $1,969,611.

Titeflex, Inc., Newark, N. J., high tension ignition harness, $369,927.

Defense Production Appointments Made

• Consolidated Vultee Aircraft Corp., San Diego, has named **Howard G. Golem** director of procurement, to be in charge of both subcontracting and purchasing.

• H. B. Ives Co., New Haven, Conn., manufacturers of quality finish hardware, has appointed **Eric Wilkinson** as a specialist in war procurement business.

• Brunswick Ordnance Corp., New Brunswick, N. J., a wholly owned Mack Trucks, Inc. subsidiary, has named **R. W. Walker** executive vice president and director. Brunswick Ordnance, organized by Mack to assist in the defense program, will produce essential gear and axle parts for Army Ordnance heavy motor trucks.

• Texas Engrg. & Mfg. Co., Inc., Dallas, has named **L. E. McHaney** contract administrator, with supervision over all TEMCO contracts, both with the government and with other manufacturers. He was formerly contract administrator for the Bureau of Aeronautics Representative, Dallas.

Threadwell TAPS

THREADWELL TAP & DIE CO. Greenfield, Mass., U. S. A.

DRILLING & TAPPING STAINLESS STEEL

S.A.E. Stainless Steel Type	DRILLING (with High Speed Drills)		TAPPING (with High Speed Taps)	NEAREST S.A.E. EQUIVALENT
	Surface Feet per Minute	Approximate Feed (on Drills ¼" to ½" Diameter)	Surface Feet per Minute	
443	35 to 75	.003 to .007"	15 to 25	3145, 3250, 4650, 6150
440	20 to 40	.003 to .007"	5 to 15	High Speed Tool Steel
440F	50 to 70	.003 to .007"	10 to 20	1060, 1070, 1095
430	35 to 75	.003 to .007"	10 to 20	3140, 4140, 6140
430F	70 to 115	.003 to .007"	15 to 40	1030, 1120, X1340
420	30 to 60	.003 to .007"	10 to 20	1095, 3150, 3312, 6150
420F	70 to 90	.003 to .007"	15 to 25	2315, 2340, 2345
416	70 to 110	.003 to .007"	15 to 35	1030, 1120, X1340
410	35 to 75	.003 to .007"	10 to 25	3140, 4140, 6140
329	20 to 40	.003 to .007"	5 to 15	Copper-nickel alloys
303	35 to 85	.003 to .007"	15 to 30	3120, 3145, 4615
302	15 to 40	.003 to .007"	10 to 20	Copper-nickel alloys

NOTE: These speeds and feeds are based on general drilling and tapping jobs. Slightly higher or lower values may be desirable on specific applications.

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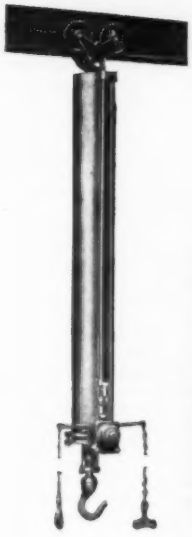

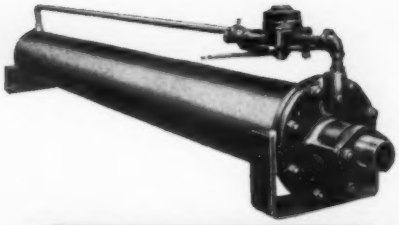

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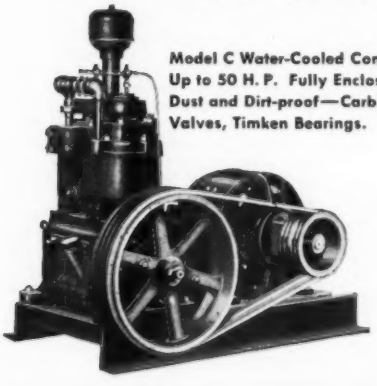

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Herbert Harig served his apprenticeship with Brust and Harig, has since been a journeyman, toolroom foreman, sales engineer, works manager, and is now vice-president of Harig Manufacturing Co., a leading manufacturer of tools and dies. He is treasurer of NTDMA

crease of a carbide die as compared with a high chrome high carbon die?

HARIG: That has been a variable. I would say this: If you are comparing carbide against a good high carbon high chrome with comparable construction—that is where you run into a terrific difference—if you had a good high-grade tool steel die, you can get down as loc as 2 to 1, for a simple shaped opening. Then you can go up as high as 5 to 1.

QUESTION: Would you say 4 to 1 is a sensible answer?

HARIG: Unless you happen to hit a customer who has a tool that has been made awfully cheap in steel and the construction does not compare with what is supplied in a good carbide. That is your variable.

QUESTION: With the brazed type carbides, what do you find the limit to be in thickness of the steel cut?

HARIG: I, personally, don't know the limit. We have been cutting 14-thousandths stock and still staying away from brazing. I think the one that might give the best answer is Jack Kleinoder, who has been cutting about as thin metal as you can run into. He informed me he is getting away from brazing because even there it is not 100 per cent satisfactory. As I said before, I wanted to mention it as a method, but don't recommend it.

KLEINODER: We have found the brazing method to be outdated for the simple reason that the finishing of carbides today has progressed to such a point we can machine it much faster than we did five years ago and it no longer pays. But there are people in this room who are finishing carbides at a much faster rate than we are.

EGLINTON: We have handled brazing as a regular thing. I have to go into the background of our activity a little bit. We make gages and have for many years and die-making is a new thing with us. We found out in practice we are forced to use brazing in gages, but we could never use it in die work. We have never been able to braze a piece of carbide on a steel shank and hold the accuracy we have to have. We have to guarantee these things to be within 10-millionths of an inch. Our shop is equipped differently from most die shops. We have a room we keep constant at 68 degrees. We are in contact with the work of the Bureau of Standards all the time, and we don't have nearly as much contempt for a ten thousandth as the guy who isn't. We figure it is a pretty fussy measure. We find we can't braze a piece of carbide to a shank of steel by any means we have ever been able to learn up to now and maintain the accuracy in the carbide that is required. We learned 15 years ago that we can stress the carbide and the shrinking stresses we think in the steel shank itself exert a surface tension draw on the carbide that distorts it.

Am I on the right track, Mr. Judkins?

JUDKINS: Perfectly.

EGLINTON: We have been able to work to great accuracy. Sometimes it is only to a fraction of a ten-thousandth. Our company was the first to manufacture gage blocks which we guaranteed to be accurate to four millionths. Getting up into the larger size, it is obviously impractical to make them of solid carbide. Solid carbide is used only in a constant temperature. We tried to put a wafer of the carbide on the end of the steel block and we invariably distorted the carbide. A temperature rise of 10° would destroy the flatness of it. We can't braze carbide and hold to precision limits.

We carried that same approach into die making. We never attempt to braze a piece of carbide in a die. That is our reason.

MOORE: You can braze it on cutting tools?

EGLINTON: They get by with it on cutting tools because they are not required to have the same accuracy as we think is necessary.

JUDKINS: I would just like to add a very brief comment. Another very good reason why we do not ordinarily braze a working face to a carbide punch is the fact that the carbide is hard, and so is the punch shank which is made of steel, heat-treated. The brazing material is therefore trapped between two very hard metals. As a result, in certain cir-

TAPPING TECHNIQUES No. 13

Herman Van Jones had an every-day name,
So he tried a queer stunt to break into fame.

But when Uncle Sam called and broke up his slumbers,
A "tap" on Herm's knee, changed his name into numbers.

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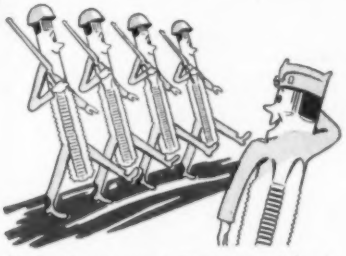
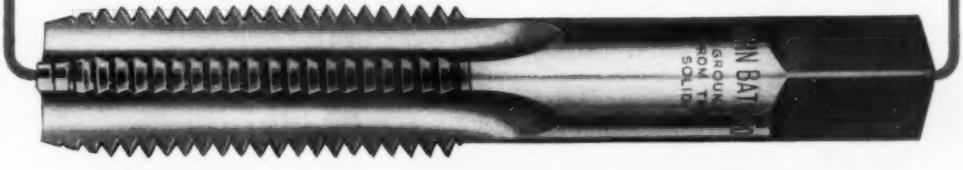
To be plainly marked on each tap to protect-ya.



This tap always passes, with a reflex that cheers,
For BATH TAPS have been "in the service" for years.



INSIST ON BATH TAPS . . . PROFIT BY THEIR PLUS-PERFORMANCE

Bath Taps are playing an important part in precision production today, especially where a better quality of thread is specified. Quality has long been associated with BATH TAPS because they are "ground from the solid" — a process that removes all danger of distortion in close tolerance work. Right now, when spoilage must be cut to a minimum, insist on BATH TAPS for economy. Whether you require taps made to standard or special size . . . we'll be glad to help you with any of your threading problems.

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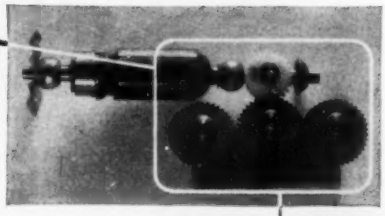

General Electric uses "Mass. Gears" in their home electric mixer as shown in illustration. Smooth quiet operation of this mixer as well as long life and freedom from attention can largely be attributed to the precision of the gears and the careful selection of the materials from which they are produced.

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cumstances the shock, impact or blow is often sufficient to extrude the softer brazing material between the carbide working face and the supporting steel shank. If it doesn't actually extrude it, it will fatigue it to the point where the brazed joint will fail. It is much better in spite of the initial cost to use a solid punch, solid from the working face to the point of support back of the punch-holder.

MODERATOR FINNEY: Mr. Judkins, you haven't said anything much specific yet about carbide cutting tools for contract shops and using such tools on the variety of steels that you ordinarily work with in the contract shop. Would you like to say something about that?

JUDKINS: Well, I omitted any mention of that because I felt most of industry is today very conversant with the use of carbide cutting tools, single point and fluted tools and cutting tools on the conventional metals. We have actually had about 21 years of practice in using carbides on all types of metals—castings, forgings, wrought—and upon non-metallic materials, such as abrasives and plastics. We are accumulating experience now in applying carbide tools to the machining of the rarer metals, such as titanium, zirconium and others which will rapidly become commonplace. Today they are rather rare but they have such fantastic properties that they are going to be used widely in jet engines and in other items of national defense, and a great deal of study is being made in the machining of so-called unmachinable metals and alloys today, with carbide tools. As far as the use of carbide tools on conventional steels and alloys, I more or less take that for granted. I would be glad to answer any questions if you have them.

QUESTION: In my shop we talk sometimes about carbide. We use ATT. It seems we are continuously failing to appreciate carbide or we don't understand how to apply it. We are using a lot of end drills and we have used the flywheel method on the smaller threads that we use, and so forth. If you can give me some fundamentals on really how to utilize these carbide cutters when you get down to an eighth of an inch end drills where you have to take out deep cavities in solid steel, I would appreciate it.

JUDKINS: That is rather a difficult assignment to cover in a matter of moments, but the various carbide companies have staffs of field engineers, some of whom are assigned to each sales district and this service is available to industry. If you have detailed machining problems, I know that we will be glad to study them and make recommendations as to

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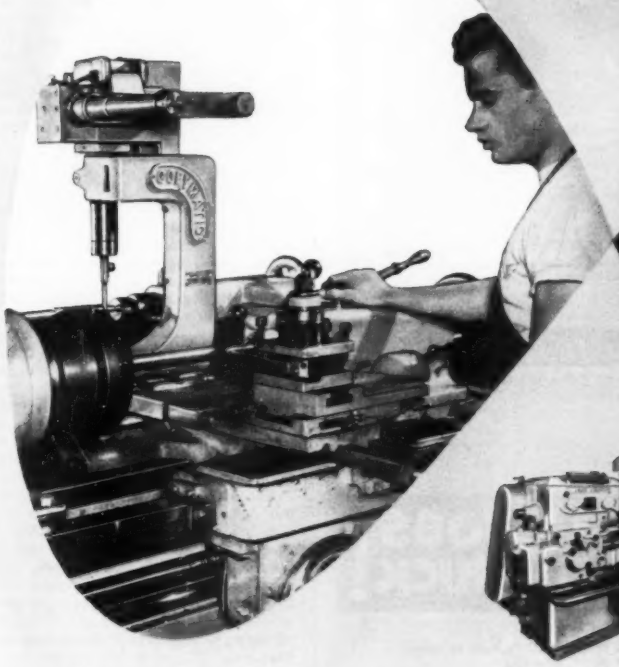

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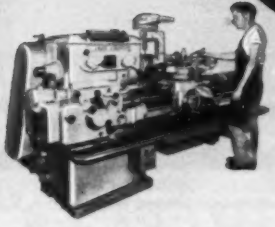

Production-rated *by users*, Lodge & Shipley COPYMATIC lathes show significant production increases and savings on every application. If you require new lathes for expanded production, consider that one Copymatic will do the work of several conventional lathes. You'll save valuable floor space and manpower—still achieve higher productivity with fewer lathes.

For example, in the illustration, the diameters on a C-1138 steel motor shaft are being turned automatically by the COPYMATIC Lathe. Carbide tools are being used with .0085 feed at 300 S.F.P.M. **RESULTS:** "300% more production" than by former methods! You, too, can obtain similar production increase with the Copymatic.

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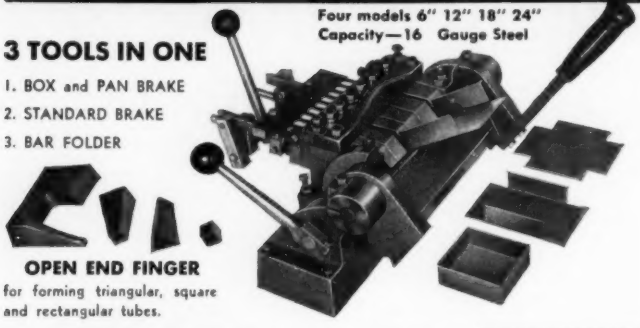

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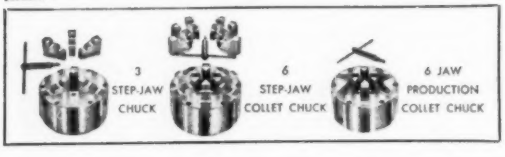

BUCK TOOL CO.
310 Schippers Lane
Kalamazoo, Mich.

grinding procedure, tool design, rake angles, number of teeth, clearance angles, relief angles, the proper feeds and speeds for cutting various materials, the kind of tool life you can expect and the methods of properly caring for these tools. A good many carbide tools are ruined in grinding, particularly in resharpening, and that service is available to industry but it is very difficult to present anything beyond general terms at a place like this.

QUESTION: We have found out you can get all kinds of advice when you have a production setup on a particular cutting problem, but we are tool and die shop owners here and we machine a lot of tool steel and a lot of high carbon high chrome steel and we have as yet not found any company that was able to recommend a good cutting tool that can be used on a shaper, lathe and milling machine.

JUDKINS: Again, I say that is asking a lot. After all, even in carbon steel we have different tempers. The list of the kinds of high-speed steels you have is really legion. You have 18-4-1, 18-4-2 and the molybdenum steels, and so on. It is only natural if you are going to do a wide variety of machining—heavy hogging, fine finishing, milling, turning, boring, planing and shaping of steel and nonferrous materials—you are going to have to have either one of the two things: A multiplicity of tools each designed to do a particular job or you will have to compromise by using general purpose tools of wide applicability.

Now, if you want a specific recommendation I will give it to you in a nutshell. If you are operating a small shop where you are called upon to machine hard steel, soft alloy steel and perhaps bronze, cast iron, and so on, my advice to you would be to use a straight tungsten carbide without any tantalum or titanium. For peak production in an automotive factory we can recommend a grade with the proper alloys that will give you the optimum performance on that specific job. But if you want to machine all kinds of materials in all kinds of ways it would be my recommendation to use a straight tungsten carbide, so-called cast-iron grade of which there are many on the market from various suppliers. It is possible to do a fair job on a shaper but only under carefully controlled conditions. We don't ordinarily recommend carbide for use on shapers because other less expensive tool materials will do a better job. But during the war under the compulsion of high production in a little time the machining of very sandy castings at Watervliet Arsenal for breech blocks and other mechanisms, was done on a shaper with carbide tools using a general purpose grade of carbide. It can be done.

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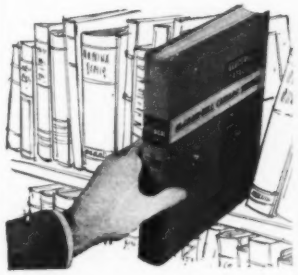

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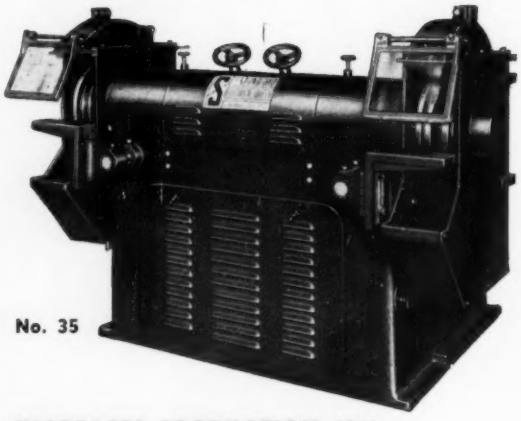

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PRESIDENT JAHN: I have just one more question. I have heard a lot of talk recently about a solid boring tool made of carbide, in order to bore a dead straight hole, and I am talking more or less now about jig borers or a precision machine of that nature. Now I am wondering whether or not you agree that a solid carbide tool will bore a straighter hole than a carbide tip tool.

HARIG: Have you never used them, Herb? We have and you definitely can get a much straighter hole. They are very good. They have a great deal more strength. You can go much deeper with a smaller diameter.

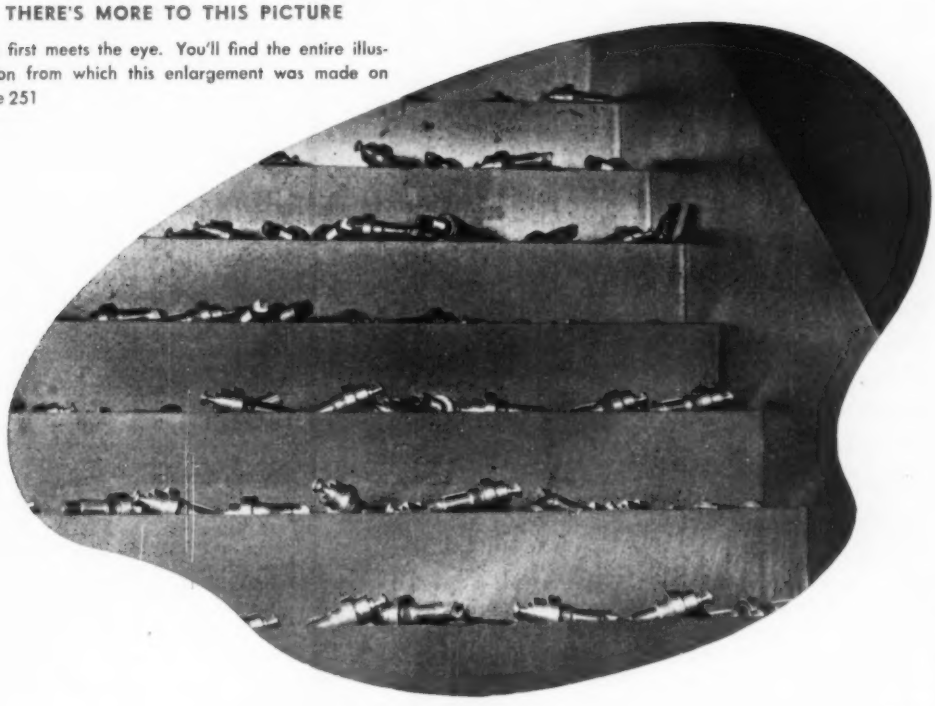
I would like to add one more thing in reference to the question of using carbide end drills and other cutters in a tool room. We have tried it. The tool room machines as a whole have not been designed rigid enough and sturdy enough for the high speeds for this application. If you have a milling machine or a shaper, in most cases it is not in the best of shape and any play is bad for a carbide tool. That ruins your end mills. If your machine isn't rigid enough, you are going to have trouble. I think it is pretty difficult to apply general purpose carbide. We do apply it in a place where we know a machine is sturdy enough and has enough speed.

Richard F. Moore founded Moore Special Tool in 1924, with one helper, as a tool and die shop. Today in addition to its contract tool and die work, the firm builds precision machine tools, including the jig grinder he developed. He was a founder and twice president of NTDMA

MOORE: Herb, the trouble is in the tool room. You might have 2 or 3 modern ballbearing rigid lathes and you might have 2 or 3 not up to snuff. With carbide, you throw the machine wide open. And if it doesn't have a stiff, rigid spindle that you can get up to 2,000 rpm, your tools will break. The same with a shaper. If the shaper fits tight and it is a big shaper for a small job and you run it up fast, carbide will work in the shaper. Your equipment is usually so diversified, with a mixture of old

THERE'S MORE TO THIS PICTURE

than first meets the eye. You'll find the entire illustration from which this enlargement was made on Page 251



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and modern machines. Where the machines aren't always up there, you will have trouble trying to use carbide mills and so forth in the tool room. But, there are lots of places in the tool room where carbide comes in mighty handy. If you break a die made out of high carbon high chrome steel, with a good vertical spindle in the miller you can take a carbide mill and you can hog out a pocket and set an insert in out of high carbon high chrome steel. You can rough out high carbon high chrome steel or any other steel with a carbide mill and you can drill a hole there with a carbide tipped drill.

We use carbide in our tool room for those kinds of jobs, and we use it in jig borers with those types of tools just because your tool holds up better and you can get a straighter hole. But we do not use carbide mills or milling cutters generally in the tool room, although we use them entirely in our machine shop where we have the machines that will stand it and the techniques for using it. You have to be sure of the grinding. The ordinary toolmaker is not experienced with the grinding of carbides. He doesn't know how to grind a carbide tool. In the machine shop where you have repetition, the tool is developed to do a certain turning job. You keep the tool for that job. That is why I think that mainly carbide doesn't work out too well in general in a tool room.

MODERATOR FINNEY: Mr. Rehner, would you like to add anything on any of these questions?

REHNER: Thank you sir. I have nothing to say about Method X, but I would like to add just one thing on that boring problem, using solid carbide boring spindles. We have them at the present time from a diameter around 0.090 up to 1¼ in. We bore all our die sets with a solid die bore 18 in. long. That is quite a costly piece of carbide. We are taking advantage entirely of the rigidity of the carbide. Now, on the smaller pieces, we are doing very small hole grinding. There again, using a solid carbide spindle for the wheels. The whole thing is that you have rigidity and as your wheel starts to kick or the bar moves, you have a vibration that moves the surface.

MODERATOR FINNEY: I will take one more question.

QUESTION: I would like to ask Mr. Judkins whether he has had any experience in the use of carbide for Inconel.

JUDKINS: Yes, sir, on Inconel and Inconel X. It depends on the work. If it is a forging with a generous coating of very abrasive oxide and you are taking a hogging cut, we might not recommend carbide. We

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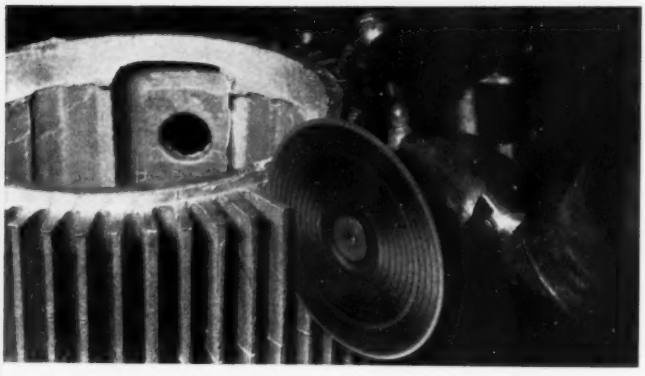

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might recommend high-speed steel or one of the cast alloys. On the finishing operations after the material has had the scale removed, the use of carbide is not only indicated but strongly recommended. It can be machined with comparative ease with the proper design and grade of carbide.

PRESIDENT JAHN: I think we would all like to thank Mr. Finney and the panel. As far as I am concerned, this is the best panel discussion we have ever had.

ROUND TABLE *Discussion*

FIRE OR FIZZLE

THE EMPLOYEE may be a fizzle in one department yet make good in another. He must be interested in the job he is assigned to. I have seen employees who did nothing but horse around one one job suddenly turn around and make good in another. If we expect the employee to give his best we must supply some incentive. This does not necessarily mean in dollars and cents. Good supervision, good working conditions are often more important than the pay check. Opportunity and a recognition of some particular ability are others.

One of the first things the foreman should find out is whether or not the employee likes the job he is doing. If the employee does not like the job then the foreman should find out why. Very often he will find the employee can do better work at some other job that is more in line with the employees capabilities. There are other employees who like a job which requires them to keep moving constantly. They do not want one of those clock watching jobs. We must all do our best to analyze what goes on in the employees minds to affect their attitude toward the job. Any fool can find fault, but the supervisor or foreman who is employee-minded will outproduce the supervisor who is production-minded. That is why it is our job to concern ourselves with the workers' personal problems.

A. E. Salmons
Philadelphia

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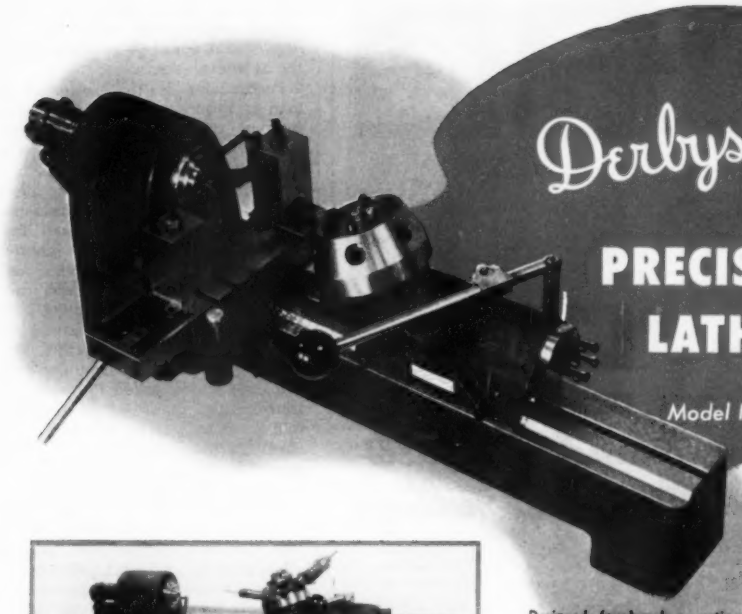
ARE DEPARTMENTS in a works separate entities or are they units of one whole; that would seem to be the question. If the latter, then deci-



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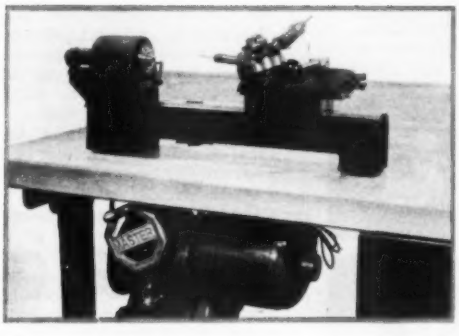

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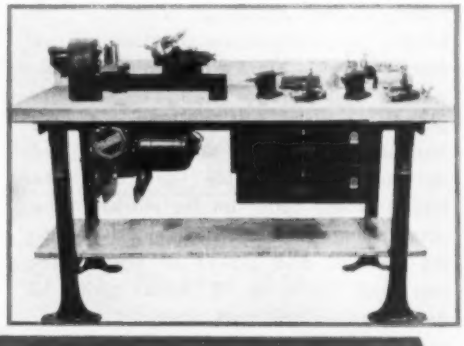

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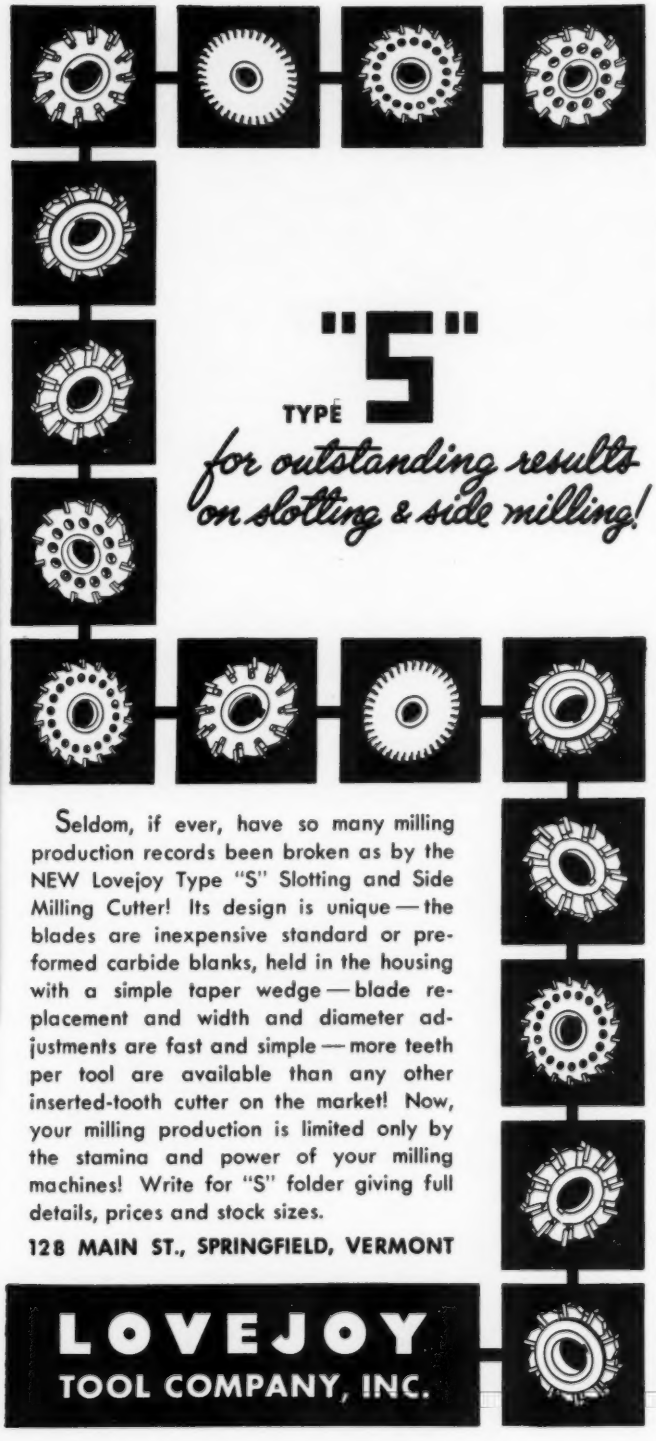

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TOOL COMPANY, INC.

sions as to the suitability for individual employment made in one department ought to be binding for the whole works.

Particularly is this so when a man is fired for the really serious reasons of "insubordination and general inefficiency." Yet Potts was discharged for these reasons one day and was re-engaged the next day—it could have been the same day—in the assembly section. The fact that Ed's report was ignored goes to suggest that discipline and standards of efficiency did not really matter and that anything with two legs wearing trousers could fill the bill. If this were the case, why did Ed go to so much trouble; why not simply have asked Personnel to transfer the man. Ed could have told them he was an awkward, disobedient, useless cuss of no value and they could have put him in assembly at once!

It may be of course that Personnel was not allowed to discriminate; that they are instructed to engage all applicants or to pin-point every second, third or nth man. This would certainly be a plan and not much worse than much of the planning so vainly boasted of today. The sound of the word must be as sweet to some ears as "that blessed word Mesopotamia". But there is a better method.

Personnel staff, even if some be technical, should act in an advisory rather than an executive capacity. They should deal with all applicants and discharges. The first would be submitted to the foreman and engagements confirmed by the works manager. The notes for the latter should come via the works manager's office and bear his stamp. This would give the opportunity for inquiry and the writer has knowledge of the value of this routine in dealing with large numbers of men. The works manager's review had real value and was respected by all; men of the Potts class would suffer but not the foremen's self-respect or the standard of the works production force.

P. E. James
Lindum, England

•

SAFETY LAST

THE LOSS or injury of any part of the body is handicap for some kind of work, and this is a major point for a workman to understand and ever be conscious of that he may be alert to conduct himself in a safe manner. Any person can lose sight of an eye in less than a second of time by being careless. Of course

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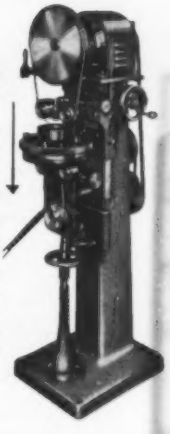

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THE HARTFORD SPECIAL MACHINERY CO.
287 Homestead Ave., Hartford 12, Conn.

Please send me free Bulletin PM-100 describing your Die Polishing Machine and new Diamond Belts.

Name _____ Post _____
Company _____
Street _____
City _____ Zone _____ State _____

From the *American Machinist* Library of *Tips for Top Shop Men*

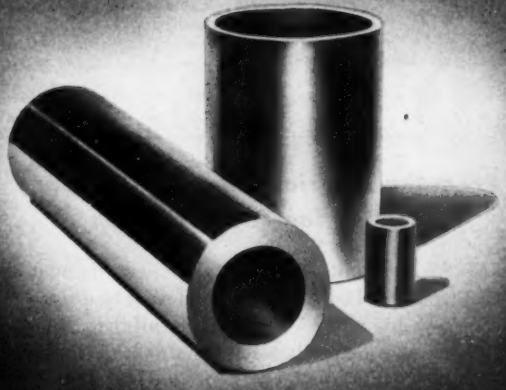
DESPISE the political maneuver called "damnation by innuendo". The apparently innocent question, "Does Johnson beat his wife?" is just as harmful to Johnson in the long run as your positive statement that he does. Watch remarks like "Is Smith slipping?", or "Is Jones' health poor?", unless you have a malicious desire to see the thing happen.

Buckeye

An Extra Measure of Quality

Not visible to the eye but proven by performance is the inherent EXTRA quality of Buckeye Bronze. This extra measure of value can only come from years of qualified experience. • Consult your nearest Buckeye Distributor . . . a recognized bearing authority. He maintains adequate stocks of Buckeye Standard Stock Bushings and Fully Machined Maintenance Bars to bring this quality performance to your doorstep. The Buckeye Brass and Manufacturing Company, 6410 Hawthorne Avenue, Cleveland 3, Ohio

50 Years Service to Industry



BARS • BEARINGS • BUSHINGS

one can get by with a glass eye as far as outward appearances are concerned, but it is no aid to the person for actual seeing and if the second eye is lost the average person is in a desparate position, in spite of the fact that occasionally one thus affected does learn to do some remarkable things by intensive alertness and study.

One may handicap and cripple himself just as carelessly and quick in many other ways. No remuneration can fully compensate for the loss of any part of the body. At every point in a shop where an injury is at all likely to occur there should be a notice conspicuously posted warning the operator of the risk.

A record should be kept of each individual's injuries as well as the total injuries of each department. These totals should be kept posted on an honor roll as an incentive for each person to boost his department safety record. Recognition of those making the best achievements should be recognized as individuals and departments. The manner of recognition would best be varied to meet special needs and vary in different locations to meet the custom prevalent in their locality.

H. B. Martin
Watervliet, N. Y.

HEAD BEATS HANDS

I CAN agree with Madison in trying out a lazy man on a job where a fast pace had already been set. It fell to my lot while learning the trade to be placed as an assistant to one of the laziest men that I ever met, who also had the ability to plan and work out short cuts, and simple and easier ways of doing a job beyond any other man it has been my fortune to meet.

This man was very alert as well as deep thinking, but very saving in the use of his muscles, I never caught him making a quick movement. Of course I would not advise anyone to place a lazy man on a job unless he has ambition, for we have all seen too many with tired propensities who never did make good. However there are those who are termed lazy who have a keen intellect and who use it to every advantage they can, to make life easier for themselves. Give such as these a trial.

The lazy man who has ambition should not be counted out just because he is lazy.

John Mark May
Watervliet, N. Y.

Mr. Resale Machinery Manufacturer . . .

Here is a full line of motor starters Manual or Automatic—Single or Polyphase

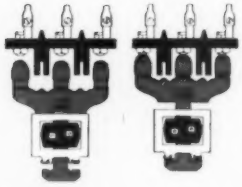
If you use different types and sizes of motor starters on your machines . . . it will pay to standardize on the A-B line.

Why? Because this line is uniform in design up to 300 hp. All Allen-Bradley starters are solenoid or straight line operated . . . with maintenance free, silver alloy contacts . . . and dependable overload relays.

Allen-Bradley manual and automatic starters are nationally advertised. They are recognized the world around as *Quality Motor Controls* by important machinery buyers and plant engineers.

The Allen-Bradley Handy Catalog is an up-to-the-minute guide for efficient motor controls and accessories. Let us send you a copy of the latest edition. Write, today!

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.



SIMPLE—

Only One Moving Part

The key to the remarkable performance of Allen-Bradley solenoid starters is their simplicity. They have no pins, pivots, or bearings to stick . . . no jumpers to break.

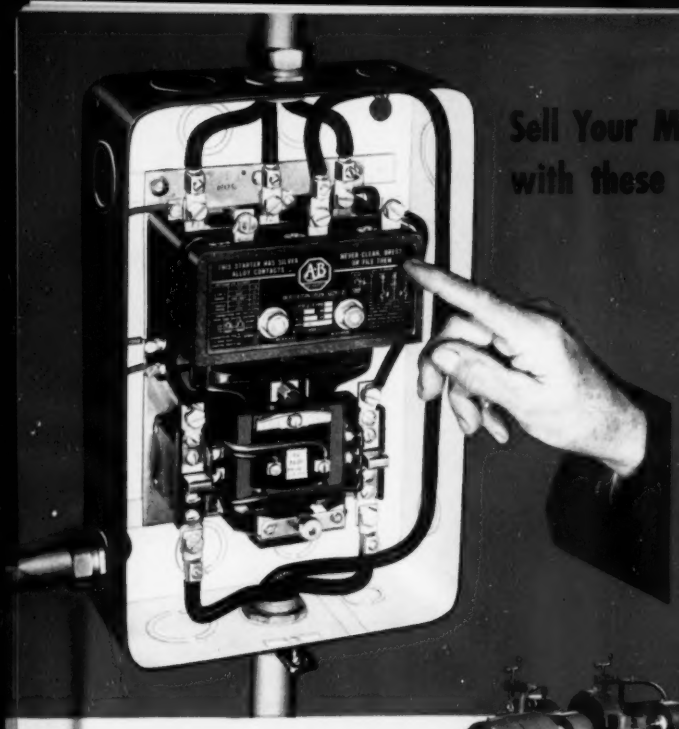
There is just the one-piece solenoid plunger in a frictionless slide. Such simplicity means long, trouble free operation in the toughest service.

251-R

ALLEN-BRADLEY

SOLENOID STARTERS

QUALITY



Sell Your Machines "Factory Equipped" with these TROUBLE FREE STARTERS...

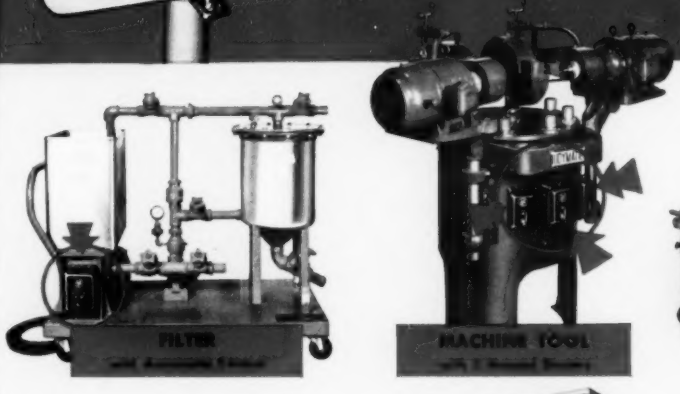
They enjoy world-wide acceptance

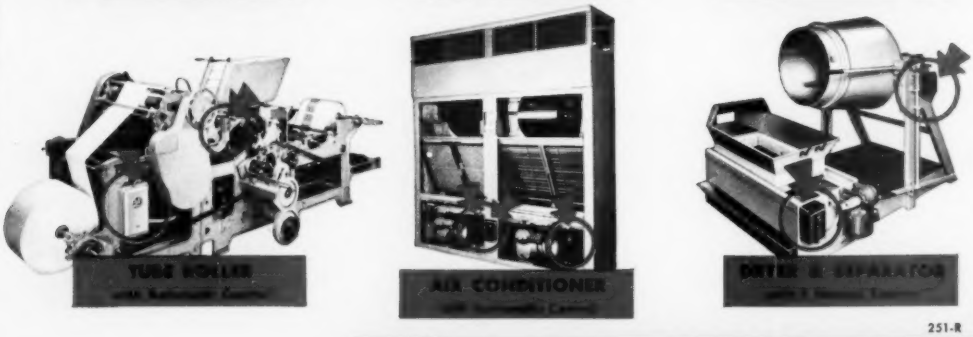
Your motorized machines are no more dependable than their motor controls. So why not add a big sales asset to your products by featuring A-B trouble free controls as standard equipment.

The A-B name plate means Quality controls to your customers.

They have learned and know the operating advantages of Allen-Bradley solenoid controls—no pivots, pins, hinges, or bearings to corrode and stick—no contact maintenance.

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.





251-R

Enclosures for Every Service

A-B Quality

Send for the Allen-Bradley Handy Catalog

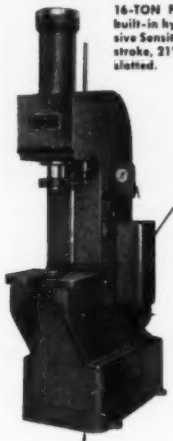
ALLEN-BRADLEY

SOLENOID STARTERS

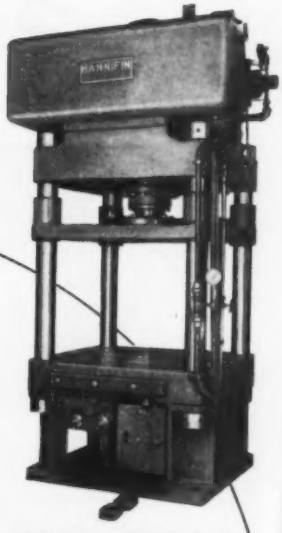
QUALITY

HANNIFIN
*Standardized**
HYDRAULIC PRESSES

** Standardized for Earlier Delivery, Lower Costs.*



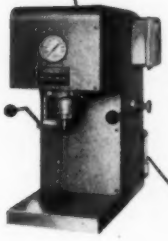
16-TON FORCING PRESS *(Left)* — With built-in hydraulic power unit and exclusive Sensitive Pressure Control. Gap, 22"; stroke, 21"; reach, 9½". Table, 16" x 20" slotted.



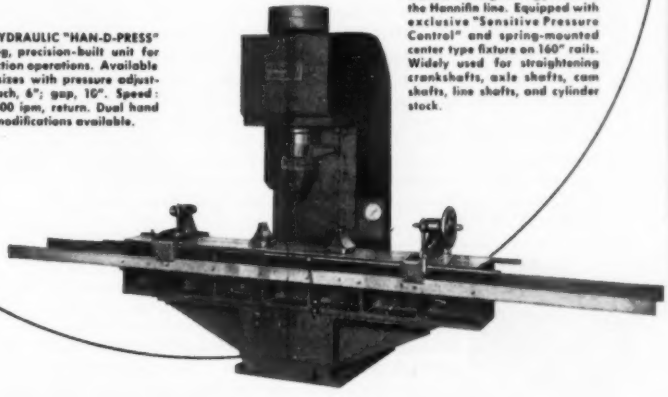
150-TON FOUR COLUMN PRESS *(Above)* —A standard Hannifin design with semi-automatic cycle. Advance at high speed, feed stroke starting at preset point in stroke and automatic reversal. A complete self-contained unit with reservoir, hydraulic pumps, and controls on top of press. Dual electric push button control.

. . . Sizes . . . Types . . . Controls to meet your requirements!

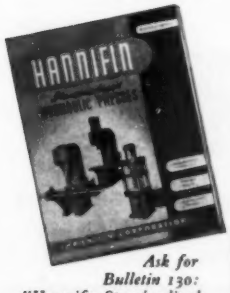
YOU can save both time and money when you select the presses you need from Hannifin's big line of *standardized* Hydraulic Presses. Hannifin builds more than 75 standard models in a range of capacities from 1 ton to 150 tons. Hannifin designs are readily adaptable to modification at minimum expense. In most instances, reach, gap, stroke, speed, size of table, and type of control can be changed easily to meet your particular requirements. *For recommendations, call in Hannifin engineers or submit specifications.*



HANNIFIN'S NEW HYDRAULIC "HAN-D-PRESS" *(Left)* — A fast-acting, precision-built unit for handling light production operations. Available in 1-Ton and 2-Ton sizes with pressure adjustable. Stroke, 6"; reach, 6"; gap, 10". Speed: 400 ipm, advance; 800 ipm, return. Dual hand controls standard — modifications available.



35-TON OPEN GAP STRAIGHTENING PRESS *(Left)* — Model S-351, one of the seventeen standard straightening presses in the Hannifin line. Equipped with exclusive "Sensitive Pressure Control" and spring-mounted center type fixture on 160" rails. Widely used for straightening crankshafts, axle shafts, cam shafts, line shafts, and cylinder stock.



Ask for Bulletin 130: "Hannifin Standardized Hydraulic Presses"

HANNIFIN CORPORATION

1117 So. Kilbourn Ave. • Chicago 24, Illinois

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In Canada: F. F. Barber Machinery Co.

Hours of Machining Time *Saved!*

because *DOUGLAS* uses the PROFILOMETER

Profilometers are in use constantly for production control of machining operations at Douglas Aircraft Company's plant in Santa Monica, Calif. In many instances, Douglas found that surface roughness ratings could be held well within engineering specifications even after machining time was reduced considerably.

Here is a typical example. The milling operation on one surface of the aluminum part illustrated—and which is produced in fairly high volume—had been run with a feed of 21 inches per minute. This produced a surface roughness rating of 40 microinches. For this part, a 100 microinch finish was specified as maximum. After increasing the feed to almost 50 inches per minute, it was found that the finish still was entirely satisfactory. As a result, machining time for this operation was decreased by more than half!

It is interesting to note that, at Douglas, Profilometers serve a number of departments. They may be used by inspection, by the production standards department or by production departments near the machines on which the surfaces in question are being produced. Douglas recognizes the Profilometer as a *shop instrument.*

To learn how the Profilometer can help cut costs in your production, write today for these free bulletins.

Profilometer is a registered trade name.

PRC

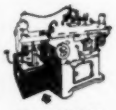
PHYSICISTS RESEARCH COMPANY

Instrument Manufacturers

ANN ARBOR 4 • MICHIGAN

YOU ARE NOW READY FOR INCREASED PRODUCTION AT LOWER COST . . . PROLONGED TOOL LIFE . . . BETTER QUALITY WORK

FOR DRILL PRESS



FOR GRINDER

FOR LATHE

FOR CUTOFF MACHINE

Graymills Coolant Systems are made for 'round the clock operation . . . pumping coolants or heavy oils.

The above model G4-2-04, installed in 5 to 20 minutes, delivers enough coolant for a 6 to 8 spindle press. It is one of many complete Graymills Coolant Systems which will help you reduce tool costs, increase cutting speeds and improve quality.

RECOMMENDED AS REPLACEMENTS FOR MANY SMALLER COOLANT SYSTEMS WHICH ARE NOW BEING USED ON LARGER MACHINE TOOLS.

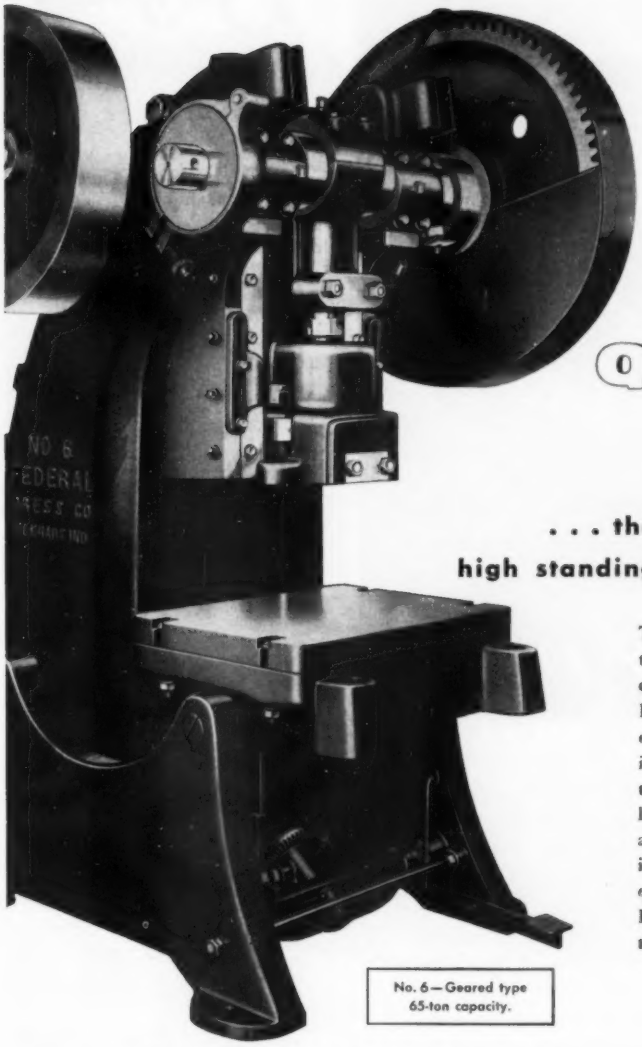
Used on all types of machine tools, the New Improved Graymills Coolant Systems are priced from $44.50. Gear and centrifugal pumps are 1/25 to ½ HP. 1 gal. to 70 g.p.m. Tanks 1 gal. to 38 gals. Fittings and recovery pans available.

*Model H-2-3325 $59.50

GRAY MILLS

WRITE TODAY FOR NEW CATALOG AND ENGINEERING DATA DEPT. 2001

GRAYMILLS CORPORATION
Evanston, Ill.



No. 6—Geared type
65-ton capacity.

QUALITY PLUS

. . . the secret of FEDERAL'S high standing among metalworkers!

Throughout the metalworking industry the name FEDERAL stands for quality *plus*. Built into every FEDERAL PRESS this extra quality includes such outstanding features as Timken Bearings, oversized crankshafts, solid web-type flywheels, symmetrical rams, longer "V" ways and gibs. It includes also a standard of workmanship that is seen in the *easy operation*, the *absence of down time*, the *longer life* of FEDERAL PRESSES. Make sure you get this *extra* quality when you next buy.

Write for catalog showing the complete line — 6 to 80 tons.

FEDERAL PRESS COMPANY 501 DIVISION STREET ELKHART, INDIANA

FEDERAL *Open Back Inclinable* PRESSES

25 YEARS OF QUALITY CONSTRUCTION

Jarvis ROTARY FILES

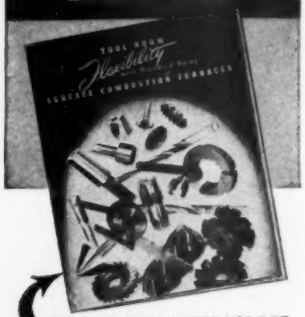
Particular Craftsmen the world over depend on Jarvis Rotary Files to do their most precise filing. Equally effective on steel or bronze, magnesium or aluminum, plastic or wood composition, many-shaped Jarvis Rotary Files come with coarse, standard, fine, super-fine, diamond or herringbone flutings — specials for special jobs. Rigid quality control and most advanced production methods make these ground-from-the-solid files better than ever before. Used with Jarvis Flexible Shaft Machines, they make a perfect combination for dependable, quality production. For free literature write to The Charles L. Jarvis Company, Middletown, Connecticut.

Jarvis POWER TOOLS

TAPPING ATTACHMENTS
TECNI-TAPS and DIES
ROTARY FILES
FLEXIBLE SHAFTS and MACHINES
QUICK CHANGE CHUCKS and COLLETS

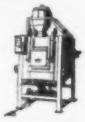
THE CHARLES L. JARVIS CO., MIDDLETOWN IN CONNECTICUT

'Surface' STANDARD RATED FURNACES for TOOL ROOMS

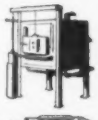


THIS INFORMATIVE FOLDER Bulletin SC-123, is fully descriptive of 'Surface' Standard Furnaces' application to tool room heat treat needs.

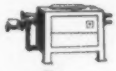
ATMOSPHERE FURNACES
Balco, Char-Mo, Atmotrol for clean, scale-free heat treatment.



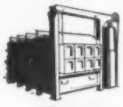
MUFFLE FURNACES
for use with protective atmospheres to prevent scaling and decarburization.



POT FURNACES
for drawing, cyaniding, liquid carburizing, or quenching.



OVEN FURNACES
for general heat treating or heating operations. Direct fired.



CONVECTION FURNACES
for drawing or tempering of tool steels.

SURFACE COMBUSTION CORPORATION
TOLEDO 1, OHIO

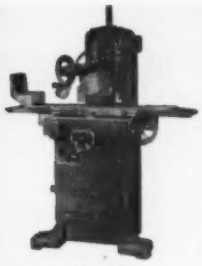
If you need
PRECISION GROUND SURFACES

See the complete line of Grand Rapids Grinders

Tool room types — production types

In small job shops and in America's largest industrial plants, more and more Grand Rapids Grinders are delivering tool room accuracy with micro-inch finish at production speeds. Your inquiry about surface grinders or cutter grinders, tap grinders, drill grinders or combinations, will receive prompt attention.

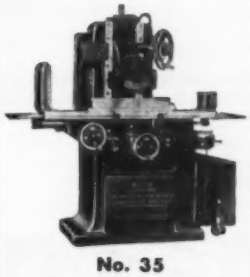
GALLMEYER & LIVINGSTON CO.
330 Straight Ave., Grand Rapids, Mich.



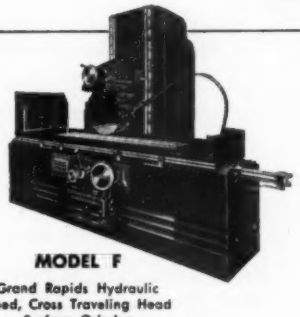
No. 20
Grand Rapids Hand Feed Surface Grinder
Size 6" x 10" x 18"

No. 25
Grand Rapids Hydraulic Feed Surface Grinder
Size 6" x 10" x 18"

No. 55
Grand Rapids Hydraulic Feed Surface Grinder
Size 12" x 17" x 36"

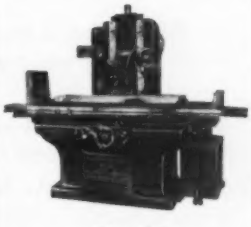


No. 35
Grand Rapids Hydraulic Feed Surface Grinder
Size 8" x 12" x 24"



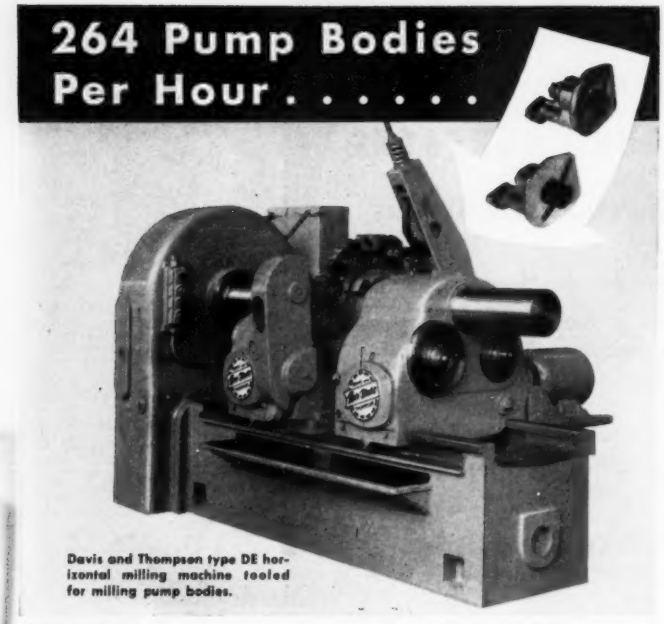
MODEL F
Grand Rapids Hydraulic Feed, Cross Traveling Head Surface Grinder
Size 16" x 25" x 48" to 24" x 25" x 96"

GRAND RAPIDS GRINDERS



No. 65
Grand Rapids Hydraulic Feed Surface Grinder
Size 12" x 17" x 48"

264 Pump Bodies Per Hour . . . . . .



Davis and Thompson type DE horizontal milling machine tooled for milling pump bodies.

1-A Standard Horizontal Milling Machine

Oil pump bodies requiring high degree of finish and high production are rough and finish milled on both sides simultaneously with this Davis and Thompson type DE milling machine. Production is 264 pieces per hour.

Patented Angular Spindle Adjustment Allows "Toe Cutting"—Maintains Fine Finish at High Production

The finishing spindle is provided with an exclusive D&T design which allows angular adjustment. This in turn results in "toe-cutting" and eliminates "drag" of the cutter over the finished surface. Both roughing and finishing spindles have micrometer endwise adjustment.

A Basically Standard Machine Employing Roto-Matic Principle For High Production Special Milling

Like all D&T machines this model DE is designed for long life and trouble-free operation. Each head has independent drive. There is backleash take up to mandrel. Anti-friction bearings throughout. Rapid traverse between cuts can be incorporated.

Free Data will be furnished upon request.

DAVIS and THOMPSON Roto-Matic

Davis & Thompson Company

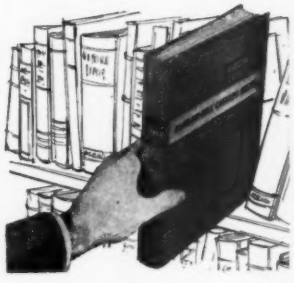
6411 W. BURNHAM ST., MILWAUKEE 14, WISCONSIN

From the *American Machinist* Library of *Tips for Top Shop Men*

DO you know just what you have in material and equipment inventories? If you don't, you'll drop more dollars than you think. It isn't necessary to know how many peanuts there are in the barrel (as one store clerk attempted to discover) but you must know how many barrels, and how rapidly one is used up.

Reach for . . .

McGRAW-HILL Pre-filed ELECTRICAL CATALOGS



when you need buying information on *electrical products* in your plant.

This compilation of manufacturers' catalog data will save time and provide the answers to such questions as:

Who makes a particular product?
(Directory Section)

What company makes the product best suited to my needs?
(Catalog Pages)

What sizes or capacities are standard?
(Catalog Pages)

What are the products' outstanding sales features?
(Catalog Pages)

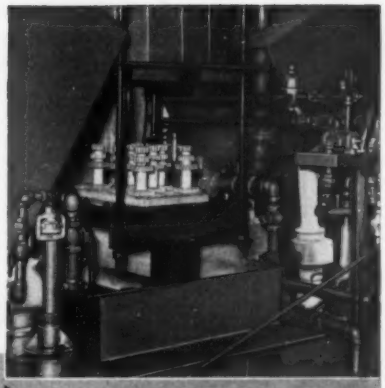
Where is the nearest sales office or representative?
(Catalog Pages)

If the Pre-Filed ELECTRICAL CATALOGS are not available for buying reference at your plant, write to:

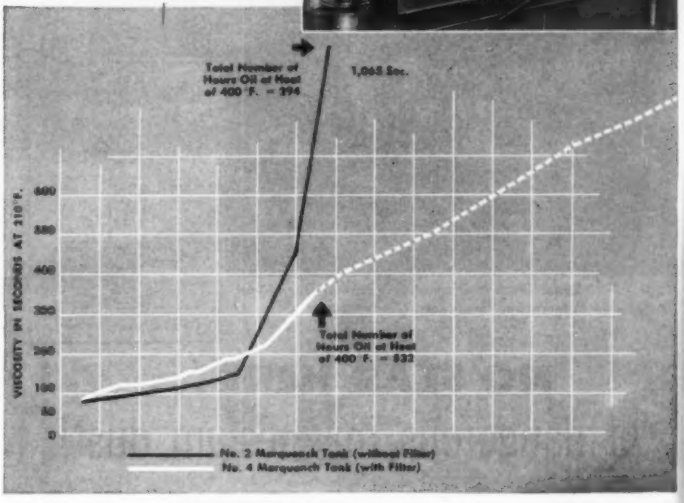
McGRAW-HILL CATALOG SERVICE
330 W. 42nd St., New York, N. Y.

There is no charge to qualified users.

Quench Oil lasts 3 times as long



View at International shows white hot gears on loweretor ready for mass Marquenching.



At the Ft. Wayne Works of the International Harvester Company the quenching oil used in No. 2 Marquench tank jumped to 1065 Sec. viscosity in 294 hours (see chart at right) and was no longer suitable for quenching operations.

A Honan-Crane Oil Purifier operating a similar tank No. 4 kept the oil clean and down to 345 Sec. at 532 hours. In fact, when the Honan-Crane Oil Purifier is used it takes about 3 times as long for the oil to reach 1000 Sec.

This means the oil can be safely used 3 times as long when a Honan-Crane Oil Purifier is used. A remarkable saving since each of these tanks holds 1600 gallons of oil.

Actual case histories at International Harvester, Salisbury Axle, Borg Warner, Cleveland Graphite Bronze, etc., show that Honan-Crane Oil Purifiers, by keeping quench oils free from dirt, products of oxidation, etc., also give these advantages . . .

1. Extended oil life
2. Quenched parts easier to clean
3. Less oil use . . . less waste
4. Cleaner cooling coils and piping
5. Reduced manual cleaning of tanks and other equipment

also . . . Honan-Crane Filters and Clarifiers for oils and coolants used in metal working operations. Removal of dirt, chips, etc.:

1. Cuts down maintenance on machines
2. Reduces cost of oils and coolants
3. Cuts down rejects
4. Lengthens tool and wheel life

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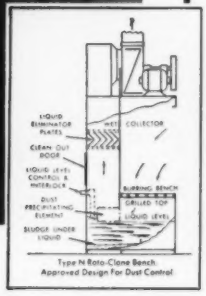
Type N Roto-Clone Bench for Magnesium Finishing Operations. Dictaphone Corporation, Bridgeport, Connecticut



Type N Roto-Clone Bench Approved Design For Dust Control

NO FEAR HERE...
of dangerous magnesium dust!

AAF Roto-Clone Type N Bench Eliminates Hazards Of Magnesium Finishing Operations.

The Type N Roto-Clone* dynamic precipitator has a remarkable safety record in efficient collection and safe storage of dangerous dust. Developed by AAF engineers for magnesium finishing, this unit or bench type wet-collector has no moving parts, pumps or nozzles, yet maintains the highest efficiency in collecting extreme fines. The Type N Roto-Clone immediately removes incendiary dust from the source by passing entrained material through a sinuous water curtain under heavy turbulence . . . induced by the flow of air through a stationary impeller. Dust is stored at once in sludge form within the base of the self-contained unit, and under water for complete safety.

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**Roto-Clone, is the trade-mark (Reg. U. S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydro-static precipitator types.*

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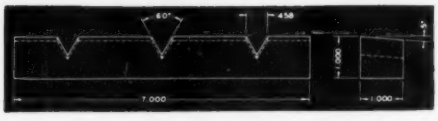

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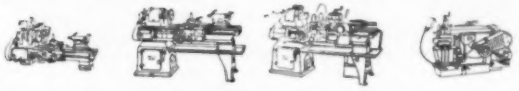

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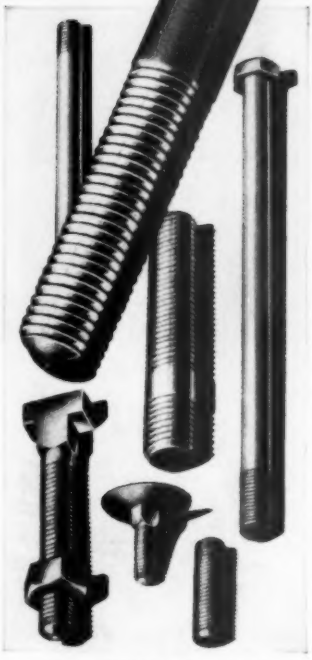

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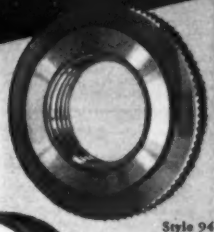

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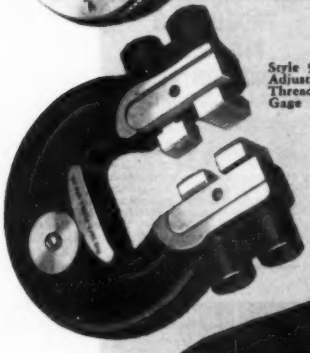
Style 9475—Pipe Ring Gage

Style 9424—Thread Ring Gage



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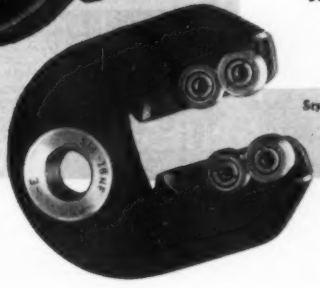

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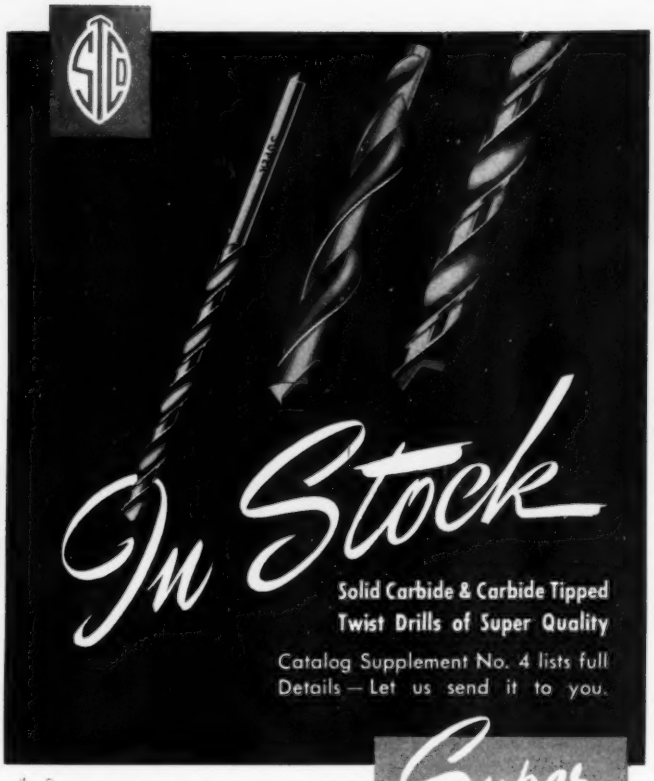
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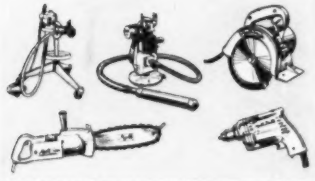

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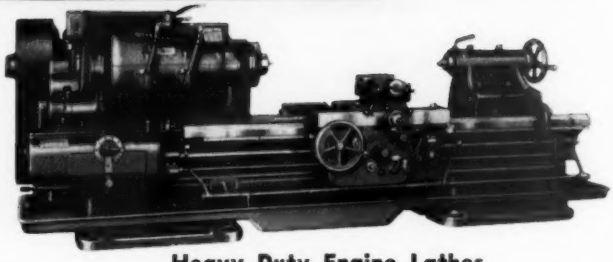

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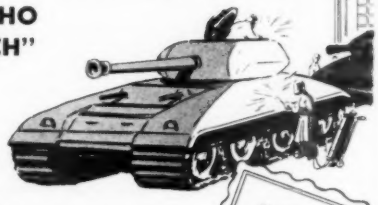

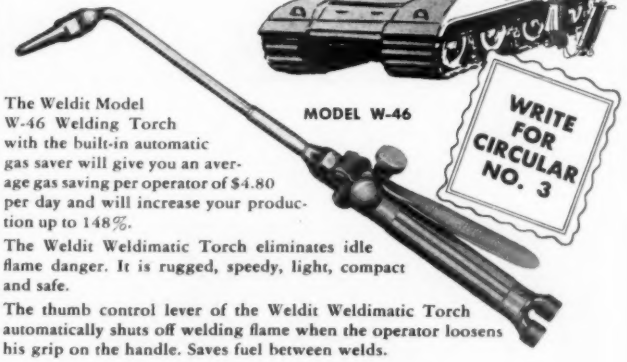

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The bundle of sticks

A wise old man called his quarrelsome sons about him. Taking up a bundle of sticks, he commanded each in turn to break the sticks. All tried, but in vain, and said it could not be done.

"And yet, my boys, nothing is easier to do," said the father, as he undid the bundle and broke the sticks, one by one. "By this example, you can see that united you will be more than a match for your enemies; but if you quarrel and separate, your weakness will put you at the mercy of those who attack you."

The useful truth of this fable is just as timely today as it was when the Greek ex-slave Aesop told it 2,500 years ago. You, a patriot, believing in individual liberty and freedom for all, see our American way of life threatened by the menace of communism abroad and jeopardized at home by complacence, negligence, confusion and incompetence.

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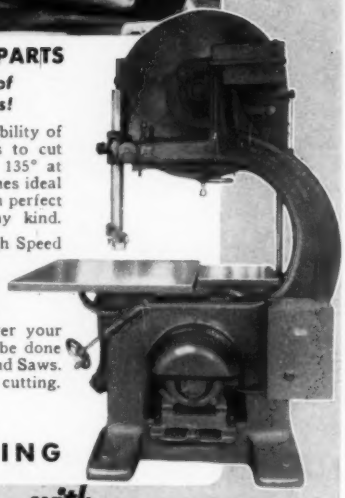

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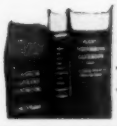

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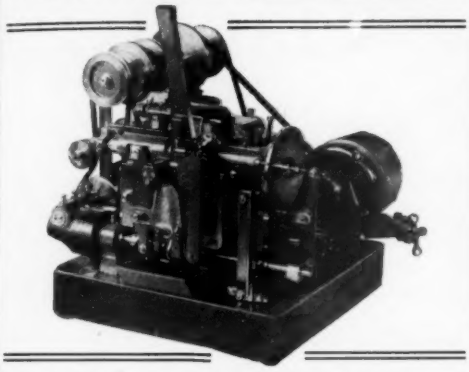

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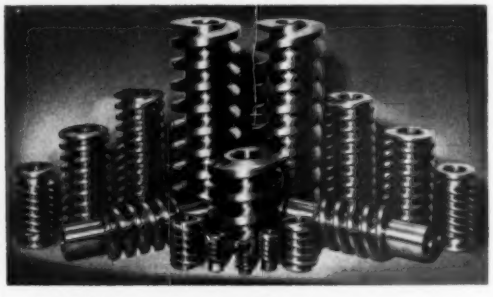

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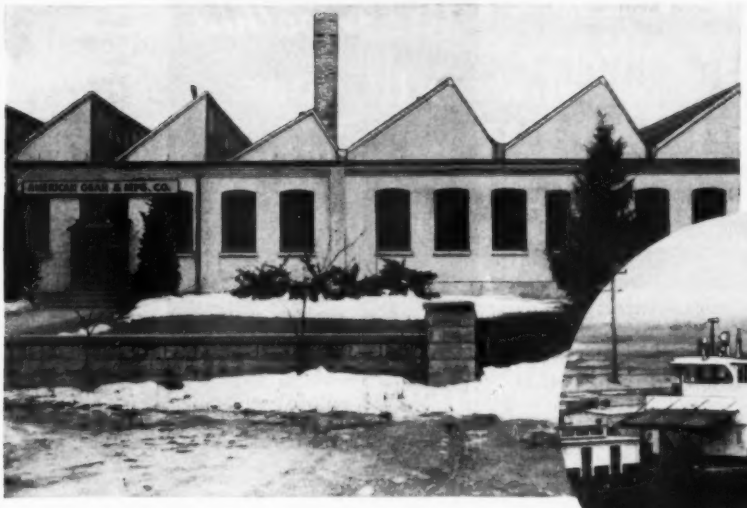

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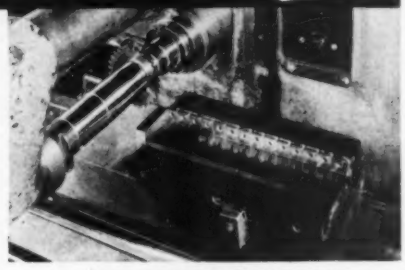

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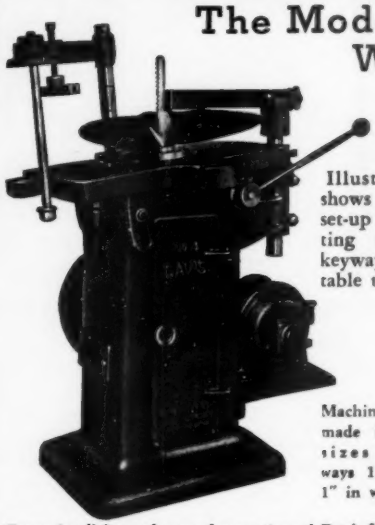

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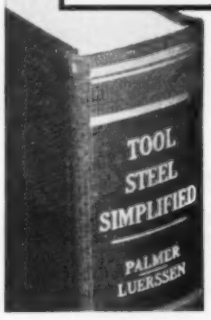

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Here's the BOOK OF ANSWERS for every man responsible for tools and dies. Shows you how to increase your company's production from present equipment—how to reduce toolmaking trial and error, conserve tool steel, avoid die troubles, simplify heat treatment. It starts "from the beginning" with *what* tool steels are, their analyses, and why one grade will outperform another on some jobs. Gives complete working information on everything from selection of the right steel to heat treating methods and equipment, hardness and toughness testing, latest data on high speed and hot work steels. 564 pages, 355 charts, photos, diagrams give you facts on: how design affects heat treatment, hardenability tests, time required to heat different tools to required hardening and drawing temperatures, furnace atmospheres, quenching, tempering, trouble-shooting.

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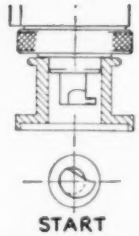

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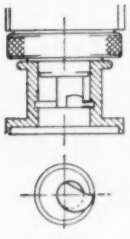

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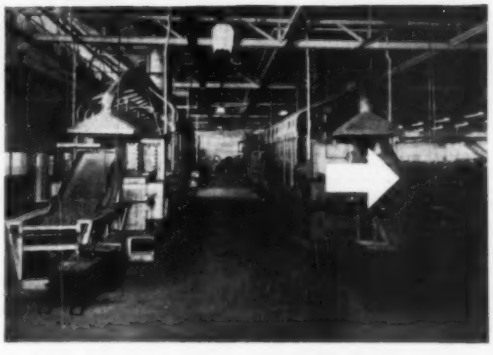

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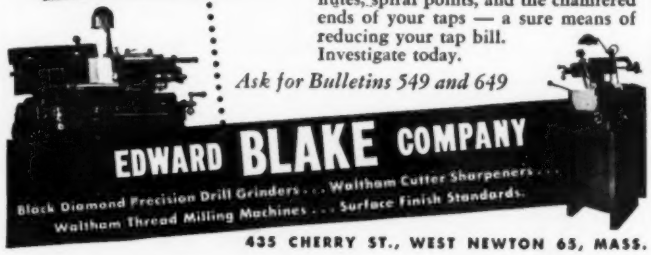

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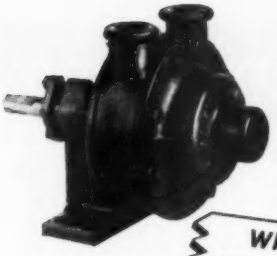

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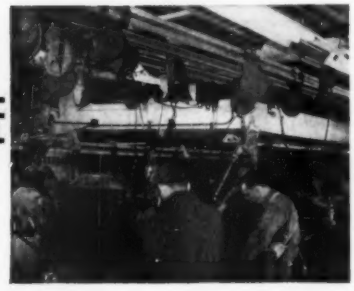

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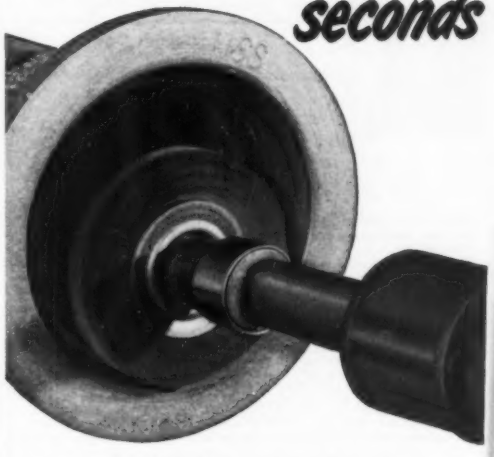

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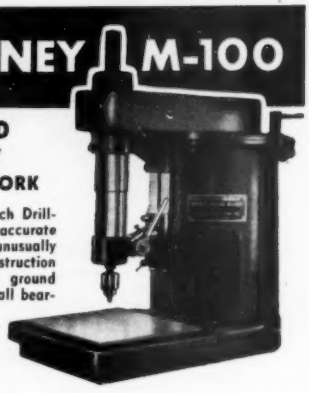

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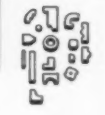
4. 

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DON'T flaunt your greater income or privileges before your subordinates. No matter how much they like you, their resentment and envy will do you more harm than the flaunting does your ego good.

REMEMBER that human problems need careful study just as do engineering problems. Man is multi-motivated and one prescription won't cure all his ills.

BE suspicious of any figures you hear, and of most of those you see. If they don't correspond immediately to your previous experience, check 'em before you quote or use 'em. The urge to make numbers bigger, or smaller than anything previously reported is overpowering to some people; don't be victimized.

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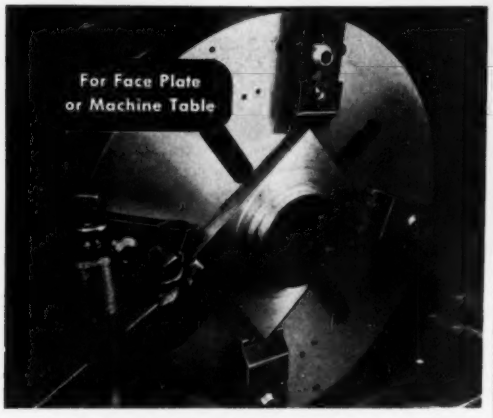
SLAVERY was not abolished by Lincoln. He did end physical slavery, but man himself must end mental slavery to habit. Education will help, but the real problem is to breed a race of open-minded, inquiring men who welcome the chance to wonder, to question and to analyze—then to take a chance on a new idea that looks sound.

PROCEDURE for methods improvement: Pick an operation to be improved. Put down in writing what happens—the details. Challenge each detail in order. Where a chance for improvement appears, develop the better method. Apply it on the job.

PRODUCTION RATES CLIMB with NEW J & S JAW CLAMPS

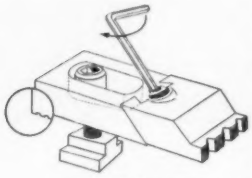


Typical lathe application shows how ONE-PIECE J & S "All-Purpose" Jaw Clamps hug machine surfaces, **reduce obstruction.** Work-piece is removed by simply loosening **one** screw in each of two adjoining clamps. NO RE-POSITIONING NECESSARY for next piece.

J & S "All-Purpose" JAW CLAMPS

***Eliminate* U-Clamps, Straps & Fingers—also, in *most* cases, eliminate four jaw chuck, vises, and making up of special fixtures! For Lathes, Planers, Milling Machines & Drill Presses.**

Fastest—Simplest—Work-pieces held rigidly, less obstruction, no slipping, **because:** a 1/16" **tapered slot insures firm grip.**



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The angle of jaw travel is 45° to plane of the face plate or table. When the screw is tightened, the jaw forces the work-piece **down** against the machine surface — **across** against the opposite clamp. This locks the work-piece in a grip that is stronger than that provided by **eight** U-clamps!

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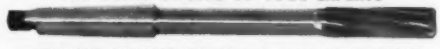

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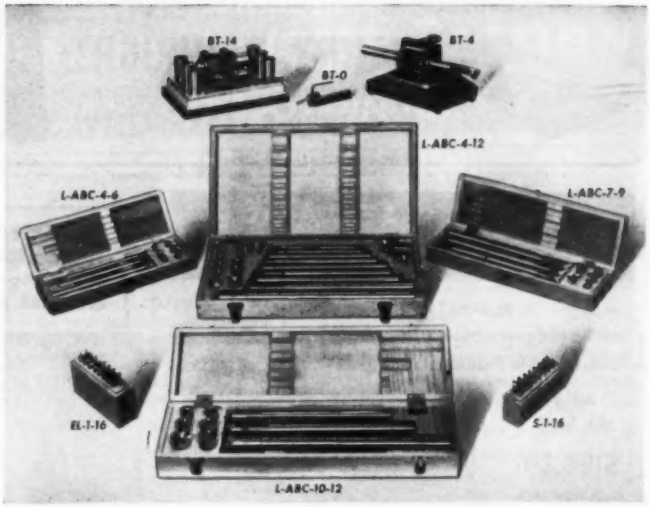

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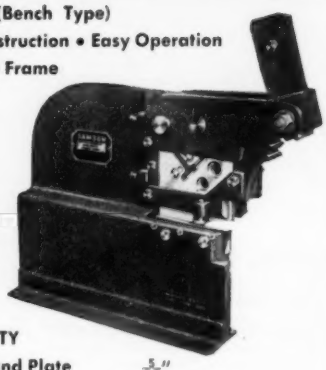

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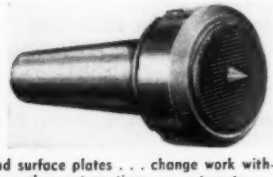

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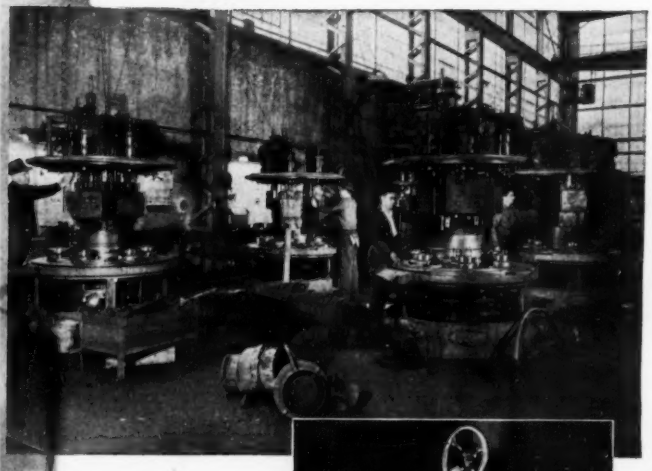

This view shows checking for spindle alignment during the course of reassembly

This view shows a battery of five BULLARD mult-au-matics being disassembled, so that all parts can be properly checked — *(worn or broken parts are replaced, slides rescraped and fitted to "new-tool" accuracy).*

This view shows a machine table being reground to "new-tool" accuracy

This view shows a late model SELLERS planer being assembled — *(our facilities are large enough to handle from the largest to the smallest machine tool).*

This view shows a small battery of machine tools in the process of being reassembled *(All reconditioned machines are stripped to their bare frames—rebuilt from the bottom up).*

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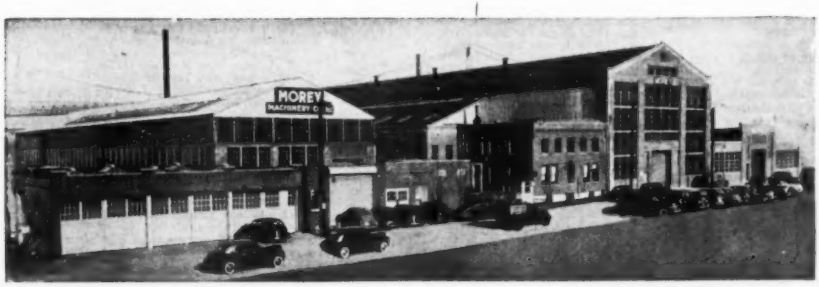
maintained our rebuilding standards for over 35 years!



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In a modern, well-equipped plant, set up *exclusively* to recondition machine tools, with more than 40 years of experience and "know-how" at your service!

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A machine is stripped to its bare frame—all worn or broken parts are replaced, ways replaned and when necessary ground or hand scraped; the machine is carefully reassembled and realigned so that when it is put "in line" it will function for all practical purposes LIKE NEW—*Our unconditional GUARANTEE eliminates any* element of risk.

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Deliveries on new equipment are very long—Why lose any time when you can put your present equipment into equal-to-new condition and have them in production for you.

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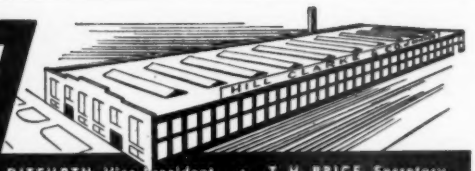

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CRANE—150 Tonx30' span, Whiting, Bridge, plus 2 Aux. Hooks 25 ton (will widen to any span).
CRANE—Shepherd 3 Ton x 30' span, floor control.
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OSTER—601 W.D. 1½" (1944)

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Turrets, 1½", 1", 1 1/16" hand screws, cone type.

MILLERS—Newton Vert. 42" Rotary Hvy.
Cinc. #3 Vert. Hi Power
Br. & Sh. #3 Universal, #2 Plain

PUNCH—Sq. end, Smith 1-1/16" thru ⅝".

ROLLS—Angle—Bertsch 3"x3"x⅜".

ROLLS—Bending—H. & J. 30'x¾", Pyr. Southwark 15'x3", Vert.

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Standard 5A—40 ton embossing-toggle.
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GRINDER, No. 16Y2B Bryant, Int., 1943
GRINDER, No. 174 Heald Gap, Int. 54" sw., '42
GRINDER, No. 72A5 Heald Internal, 1943
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DUPLICATOR, BL-2416 Keller, 3 dim., 3 spin.
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MILLER, VERT., No. 4 Kempsmith, Maxi-Mil
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MILLER, HORIZ., No. 2 Stand. K.&T., M-in-base
PIPE THREADER, 2" Landis, AC, M.D.
PLANER, 48"x36"x8' Cinci. 4 Hd., Box, PRT. Force Feed
PUNCH, 24" Wiedemann Rotary Multi.
SHAPERS, 24" & 20" G. & E., AC, M.D.
20" Hercules, Univ., New
Slotter, 20"x24" Dill, M.D.

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AUTOMATIC, #0 B & S Auto. Cut-Off 11/16" Cap.

AUTOMATIC, 1¼" Four Spdle. Cone. w/Thrd. Spdle.

AUTOMATIC, Nat-Acme #C, 5-Spdle. 9/16".

AUTOMATIC, B & S #2 Wire Feed. 1".

AUTOMATIC B & S #2G, 1".

AUTOMATIC, #53 Acme-Gridley 4-Spdl. 1" Cap. Lot of collets, cams, pads, gears. Thrd. spindle and Die Head, 5 h.p. 3/60/220/440 volts.

BORING MILL, Niles B & P 120" Vert. 30 h.p.

BORING MILL, Colburn 60" Vert. Two Hds.

BORING MILL, Bullard 24" Vert. New Era Type.

BORING MILL, Gisholt 42" Vert. 220/440 volts.

BORING MILL, Lucas #31 Horiz. 3" Bar.

BORING MILL, Giddings & L #0 Horiz. 3" Bar.

BORING MILL, Giddings & L #32 Horiz. 3½" Bar.

BORING MILL, Ryerson #11 Horz. 3" Cap. #6 M.T.

BORING MILL, Barrett #2 Horiz. Cyl. Borer. 5"

BORING MILL, King 42" Three Head Vertical. A.C. Motor Dr. Power Rapid Traverse to each head.

BORING MILL, Bullard 54" Vert. Spiral Drive.

Sommer & Adams #20A Boring, Hobbing & Threading Machine. Timken Bearings. Swings 38" over bed. 18" cross feed, 42" longit. Carriage has rapid approach & return. Used to mill internal threads. Excellent Condition.

BORING MILL, 61" Bullard MAXI-MILL. 2 Hds.

BORING MILL, #0 Giddings & Lewis, 3½" Bar. #5 M.T. 220/440 volts. TWO.

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BROACH, Oilgear 10 Tons Horiz. 56" Str.

BUFFER & POLISHER, U. S. Electrical Multi-speed Double End #9½, 5 h.p., 220 volts.

SGLE. SPDLE. DRILL, Fosdick 16" Sldg. Hd. #2

SGLE. SPDLE. DRILL, Barnes 24". #4 M.T.

SGLE. SPDLE. DRILL, Barnes 20". #3 M.T.

SGLE. SPDLE. DRILL, Buffalo #2MS. 26" #3 M.T.

SGLE. SPDLE. DRILL, Aurora 36" Sdg. #5 M.T.

SGLE. SPDLE. DRILL, Colburn #2 Mfg. #4 M.T.

TWO SPDL. DRILL, Leland Gifford 26". #2 M.T.

TWO SPDLE. DRILL, Leland Gifford 26". #2 M.T.

TWO SPDLE. DRILL, Leland Gifford #2LMS 20". #2 M.T. 11" s.o.

DRILL, Avey-Matic #3 Hvy. 2-Spdl. #3 M.T. 24".

3—SPDLE. DRILL, Leland Gifford #2 MS—14". 11"

3—SPDLE. DRILL, Edlund #2B, #2 M.T. 16". 9½"

DRILL, L. Giffords #2MS 14". 11" C.C. 3-Spdle

4—SPDLE. DRILL, Leland Gifford 20". #2 M.T. 11"

4—SPDLE. DRILL, Demco #KT. #2 M.T. 24".

6—SPDLE. DRILL, Leland Gifford 14". #2 M.T.

DRILL, Cincinnati 21" Sdg. Drilling & Tapping.

DRILL, Radial, Cinci-Bick. 5' Arm, 13" Col. #5 M.T. 24 speed gearbox. 7½ h.p. 3/60/220.

DRILL, Baker #314 Hvy. Pattern High Speed Vertical Boring & Drilling Machine, 7½ h.p. 220/440 motor, #5 Taper, 12 feeds, 9 speeds, 12¾" throat, 3" Capacity in steel.

RADIAL DRILL, Fosdick 5' Arm, 14" Col. #5 M.T.

RADIAL DRILL, Mueller 3½' Arm, 11" Col. #4 M.T. 220/440 Volts.

RADIAL DRILL, Carlton 4'-13". Motor Dr.

DRILL, Naine #12 Multiple Spindle Motor Driven. #1 taper, 3 h.p. 220/440 motor. Arranged for 18 spindles. Rectangular head, With Naine 24" Rotary Table.

BASE PITCH & SPACE MEASURING MACHINE. #337 Illinois. Late Type—Like New. Capacity—12" diameter gear, 15" between centers. Full Set of Off-Set and Straight Contact Fingers, Dial Indicator, Tailstocks and Leatherette Cover.

DISC GRINDER, Besley #203—10" Dble. End Motor Driven. 220/440 volts. Wet or Dry.

SURFACE GRINDER, Horiz. Leach 6"x12" Hand.

SURFACE GRINDER, Horiz. Thompson 18"x6" Hydraulic. 1942.

PARTIAL LISTING OF LARGEST STOCK IN THIS AREA

GRINDER, Cylindrical, Brown & Sharpe #2 Universal. 220/440 motors.

GRINDER, Tool & Cutter, Sterling #F Universal. 220/440 motors.

GRINDER, Surface, Covel #78 Horiz. Hydraulic 8"x24".

GRINDER, Cam, Landis 8"x40" "Type D" Hydraulic Semi-Automatic. New in 1942. Slight use, like new.

GRINDER, Cylindrical, Norton 10"x24" Hydraulic.

GRINDER, Cylindrical, B & Sharpe #4 Univ.

GRINDER, Cylindrical, B & Sharpe #10. 6x18.

GRINDER, Cylindrical, Cinci. 6x18 Hydraulic.

THREAD GRINDER, J & Lamson #TG-615 Automatic, Late Type

GRINDER, Blanchard #10, 20" Chuck Vert Rotary.

GRINDER, Landis Crank 10x32 Hydraulic.

GRINDER, Brown & Sharpe #2 Auto. Horiz. Surface.

GRINDER, Cincinnati #EA, 10" x 36" Hydraulic Cylindrical, Filmatic Bearings, 220 volts motors. Built-in electrics, Hydraulic infeed.

GRINDER, Heald #72A-3 Size-Matic Internal.

GRINDER, Norton 6 x 18 Hydraulic Vert. Rotary Auto. Exacto Spdle.

GRINDER, Norton 6 x 18 Hydraulic Horiz. Surface. Exacto Spdl.

GRINDER, Pratt Whitney 22" Vert. Rotary. 84" table travel.

GRINDER, Greenfield #12 Internal Hydromatic. 220/440 V.

GRINDER, Heald #70 Internal.

GRINDER, Pratt Whitney 14x36 Vert. Rotary.

GEAR HOBBER, B & S #34 Spur. 18" dia.

GEAR SHAPER, Fellows #7 High Speed.

HAMMER, Rivetting, High Speed, All Sizes, motor driven.

HAMMER, Bradley 200# Rubber Cushioned Helve, 225 to 240 blows per minute. Single pulley drive.

KEYSEATER, Mitts & Merrill #3 Giant Motor Driven, 220-440 volts motor, Capacity—24" long, 3" wide keyway, Automatic Feed.

LATHE, Pond 36"x100" Grd. Hd. With Equip. & Motor.

LATHE, 32"x10' Bridgeford Q.C.G. Grd. Hd.

LATHE, Niles 30"x30' Grd. Hd. With Equip. & motor.

LATHE, 20"x72" Sidney 'Mono-Trol'. Taper Att. Etc. 220 volts.

LATHE, 26"x16' Bridgeford Q.C.G. Grd. Hd.

LATHE, Bridgeford 26"x14' Q.C.G. 6'5" C.C. 220 volts two speed motor.

LATHE, 24"x8' Lodge Shipley, Hvy. Duty.

LATHE, 24"x14' LeBlond Q.C.G. Grd. Hd.

LATHE, 20"x10' American Q.C.G. 72" s.o.

LATHE, 20"x10' Hendey Q.C.G. Taper Att.

LATHE, Reed-Prentice 20"x60" Grd. Hd.

LATHE, 28"x8' Lodge & Shipley Q.C.G.

LATHE, 16"x8' Lodge Shipley Q.C.G. Gr. Hd.

LATHE, 16"x6' LeBlond Q.C.G. Taper Attach.

LATHE, 16"x8' Lodge Shipley Q.C.G. Grd. Hd.

LATHE, 14"x6' Hendey Q.C.G. Taper Attach.

LATHE, 14"x5' Hendey Q.C.G. Taper Attach.

LATHE, 12"x5' Hendey Q.C.G. Taper Attach.

LATHE, 12"x24" Logan #520 Q.C.G. NEW

LATHES, Turret #4 W & S Univ. 1½".

LATHES, Turret, #2 Simmons Grd. Hd. 1".

LATHES, TURRET, Gardoms & Oliver #1 Electric Bar Feed. ¾" cap. Collets, Rd. Sq. Hx. 220 volts motor.

MILL, Van Norman #2SP Horiz. 220 volts.

MILLING MACHINE, Vert. #3 Cinci. High Power.

MILLING Machines, Vert. #4 Cinci. High Power.

MILLING Machine, Horiz. #2, #3, #4, #5 High Power. 220/440 Motors.

MILLING Machine, Horiz. #3 Kempsmith Univer.

MILLING Machine, Horiz. #4 LeBlond Univ. Hvy.

MILLING Machine, Horiz. #1½ B & Sharpe Univ.

MILLING Machine, Horiz. #2 Kempsmith Univ.

MILLING Machine, Horiz. #2 B & Sharpe Univ.

MILLING Machine, Horiz. #3 B & Sharpe Univ.

MILLING Machine, Duplex, Cochrane-Bly #14 Univ.

Mill & Shaper, #9 Taper. Shaper—0" to 6" Stroke. Rotary Table. 220-440 volts.

MILLING Machine, Duplex, Van Norman #2.

MILLING Machine, Cincin. #4—36 Plain Hydmatic.

MILLING Machine, Prod. #1—18 Cinci. Hor. Auto.

MILLING Machine, Prod. #0—6 Cinci. Vertical.

MILLING Machine, Prod. #0—6 Cinci. Auto. Horiz.

MILLING Machine, Production, #12 B&S 18" Late Type (6).

MILLING Machine, Prod. #12 B&S 24" Late Type.

MILLING Machine, Horiz. K&T #2B Dble. Overarm. 220/440.

MILLING Machine, Horiz. K&T #3B Dble. Overarm. 220/440.

MILLING Machine, Horiz. Nichols Hand Millers, late type.

MILLING MACHINE, Cincinnati Vertical #3 H.S. Dial Type, W/Rotary Table.

MILLING MACHINE, U. S. #MMI-8 Cam Controlled Automatic Horizontal, #40 taper, Late Type. 220/440 motors. TWO.

THREAD MILLER, Pratt & Whitney #1165. 0x14 cap. 220/440 volts.

THREAD MILLER, Hanson Whitney 4"x9" Univ. Semi-Automatic.

THREAD MILLER, Hanson Whitney 7½x11 Univ. Semi-Automatic.

THREAD MILLER, Lees Bradner #40A Automatic Chasing. 220/440 v.

THREAD MILLER, Pine-O-Mill #3 Planetary Form & Thread Semi-Automatic Milling Machine, #40 Spdl. Timken Bearing. THY-MO-TROL Control Unit. 5 h.p.

PIPE THREADER, Williams #3, 1½" to 6".

BOLT THREADER, Hill-Acme #1½-C Sgle. Hd.

TAPPER & THREADER, W & S #11R Dual Radial. Motor and Tooling.

TAPPER, W & S #1 Sglo. Spdle.

POWER PRESS, Bliss #164 Open Back S.S.S.A. 60 tons, 4" Stroke.

POWER PRESS, Bliss #84 S.S.S.A. 56 tons, 18" Stroke, 20" between uprights.

POWER PRESS, Bliss #78½ S.S.S.A. 120 tons, 5½" Stroke, 24" between uprights.

POWER PRESS, Bliss #3A S.S. Dble. Crank S.A. Grd. 45 tons, 4" stroke, 30" between uprights.

POWER PRESS — Bliss - Consolidated #153 - B Straight Side Dble. Crank Single Action, 45 tons, 6" stroke, Bed area—24" x 41", 15 h.p. 220 motor.

PRESS, Federal #2 O.B.I. Grd. 2" Stro.

PRESS, Federal #2 O.B.I. 2" Stro.

PRESS, Federal #3 O.B.I. Grd. 4" Stro.

PRESS, Federal #4 O.B.I. Grd. 3" Stro.

SAW, Band, Tannewitz #GH-30" High Speed.

GEAR SHAPER, Fellows #72 High Speed.

SHAPER, Vert., Pratt Whitney #B—6" Motor Dr.

SHAPER—Columbia 32" S.G. Crank.

SHEAR, Squaring, Wysong & Miles #572-A, 6'x 14 ga. All Gauges & 220/440 motor.

SHEAR, Morgan 120"x¾" Guillotine Plate, 36" Gap.

SHEAR, Quickwork #A-1 Rotary 60" Throat. 18 ga.

WELDER, Federal #712 AT Motor Driven Toggle Action Projection. New in 1936. 200 KVA. 10" throat. Stroke—1" to 3". With controls.

WELDER, Federal #624B Hvy. Duty Grd. Type 75 KVA. 1½" Stroke. 17" throat. Motor driven.

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CS Ferracute O.B.I. Power Press, flywheel type, m.d.
Ferracute Double Crank, 36" between uprights, 84 ton cap.
Chambersburg 30 ton Hypro Pneumatic
Metalwood 833, 845
No. 7 and 8 Thomas Punches, latest
No. 2 Hilles & Jones Horizontal Punch, m.d.

SAWS

7½ H.P. Cincinnati Elec. Tool Co. Abrasive Cut-off Machine, type JCAW
No. 3 and 8 Nutter & Barnes Cold Saws
No. 6 Cochran Bly Cold Saw
No. 138 Espen Lucas Cold Saw, m.d.
Gustav Wagner Cold Saw, m.d.

SHAPERS

16" Cincinnati Back Geared Crank Shaper, m.d.
16" Queen City H.D. Back Geared Crank Shaper, cone
24" Potter & Johnston, cone
32" Columbia Back Geared Crank Shaper, m.d. thru gear box
32" Morton Draw-Cut, m.d., late
36" Morton Draw-Cut, m.d., late
48" stroke Heavy Duty Morton Traveling Head Draw-Cut Shaper, m.d., with d.c. variable voltage equipment, 12' bed, latest type

SHEET METAL MACHINERY

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No. 2 Campbell Nibbler, m.d.
Gray Turret Head Metal Cutter, cap. ¼", 30" throat
No. 2 Libbert Nibbler, 28" throat
Southwark Rotary Metal Cutter, 36" throat, m.d.
120" No. 100 Niagara Heavy Production Folder, 16 ga., m.d.
No. 3—⅜" cap. Gray Sheet Metal Cutter, m.d.
8' No. 196 Robinson Power Squaring Shear, m.d.

SLOTTERS

10" Newton, cone
12" Bement-Miles, m.d.
15" Canada, m.d.
20-24" Dill, m.d.
48" Niles-Bement-Pond Geared, m.d.

TAPPERS

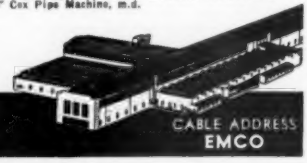
No. 1 Bakewell Precision, m.d.
No. 1R Bakewell Precision Radial Tapper, m.d., latest
Baush Radial Drilling & Tapping Machine, m.d., latest
No. 5 Webster & Perks, belt
No. 10 Kaufman High Duty Oscillating Pneumatic, m.d.

TURRET LATHE AND SCREW MACHINES

No. 1 Cincinnati-Acme Semi-Universal, m.d., chucking, Timken
No. 1L Gisholt Universal, m.d., chucking, Timken
No. 2A Warner & Swasey Universal, m.d., chucking
No. 2 Pratt & Whitney Shaver, m.d.
No. 2B Foster Universal, m.d., chucking
No. 2F Foster Fastermatic, m.d., Timken
No. 2G Morey, bar, m.d., latest
No. 2L Gisholt m.d., chucking, standard and long bed types, Timken
No. 3 Cincinnati-Acme Full Universal, m.d., chucking
No. 3 Foster Geared Head, m.d., bar
No. 3B Foster Universal, m.d., bar
No. 3F Foster Fastermatic, m.d., Timken
No. 3L Gisholt, m.d., chucking, Timken
No. 3L Gisholt, with cross sliding turret
No. 3A Warner & Swasey Universal, m.d., chucking
No. 4R Cincinnati-Acme, m.d., bar
No. 4 Warner & Swasey Plain, cone, bar and chucking types
No. 4 Warner & Swasey Universal, m.d., chucking
No. 4A Warner & Swasey Universal, m.d., chucking
No. 4FU Foster Fastermatic, m.d., latest
No. 5.0 Acme Universal, m.d., designed for glass bottle work, latest
No. 5 Foster Universal Geared Head, m.d., chucking
No. 5 Gisholt Ram Type Universal, m.d., Timken, late
No. 7 Bardons & Oliver, cone
2½x34", 3x36", 3½x32", 4x34" Jones & Lamson Geared Head, m.d., bar and chucking types
3¼" Cincinnati-Acme Geared Head Flat Turret, chucking and bar types
18" Libby Type A, m.d., chucking
20" Acme, s.p.d., bar
20" Acme, cone
28" Gisholt, cone
26" Libby Type C, m.d., chucking
#5 Woods Tilted Turret, Model D, cone

MISCELLANEOUS

Victor Nut Facing Machine, m.d., ⅝" to 2" nuts
No. 4B Nazel Air Hammer, m.d., with compressor built-in
Model PHI Brinell Hardness Tester, m.d.
Cincinnati Four Spindle 360° Automatic Profiling Machine, m.d., automatic tracing attachment, latest
Gorton Munitions Engraver, hand operated
Gisholt Precision Balancing Machine, m.d.
Detrick & Harvey 2 spindle Profiler
No. 12 Pratt & Whitney 2 spindle Profiler, m.d.
No. 20 P.H. A.D. Cook Deepwell Pump with Chrysler Engine and 200' of 8" pipe, brand new
Wagner Saw Sharpener, m.d.
Cogan Hardness Tester, Model 1618
Logan Hydraulic Vertical Shaver, m.d.
No. 1 Fischer Oil Groover, m.d.
¾" Style R Economy Automatic Threading Machine, belt
2" Bignall Pipe Machine, cone
2" Forbes Type Curtis & Curtis Pipe Machine, m.d.
16" Cox Pipe Machine, m.d.



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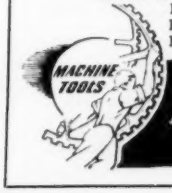
CABLE ADDRESS EMCO

SCARCE MACHINE TOOLS

No. 2 Cincinnati Vertical Mill, late
No. 72A5 and No. 72A3 Heald Plain Hy. Grinders, late
10"x18" Norton Hy. Plain Grinder, late
10"x18" Landis Hy. Plain Grinder, late
No. 2 Brown & Sharpe Universal Grinders, late (2)
No. 5U Foster Turret Lathe
No. 7 Foster Turret Lathe
No. 2 Warner & Swasey Turret Lathe, serial 580374
No. 4 Warner & Swasey G.H. Univ. Turret Lathe, serial 338359
No. 5 Bardons & Oliver Turret Lathe, serial 14063
No. 12 Gisholt Hy. Aut. Turret Lathes, late (2)
12"x63" Fay Automatic Lathe, 1940
R-14 Seneca Falls Lo-Swing Aut. Prod. Lathe, 1940
8½"x8" Goss & deLeeuw Chucker
9/16" Model DA2 Davenport Automatics (2)
S-2-F Nilson four slide Comb. Press & Wire Forming Machine, late
16"x54" Sidney G.H. Engine Lathe, late
16"-17½"x84" Porter McLeod Engine Lathes, late (2)
No. 262 Barnes G.H. Drill Press, late
No. 8 Marvel 18"x18" Metal Band Saw, late



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USED MACHINERY

Baush 44" Hvy. Duty Vert. Boring Mill, 2 Hds.
Bullard 36" New Era Vert. Turret Lathe with side head
Hilles & Jones 2" Cap. Guillotine Shear
Brown & Sharpe No. 2 High Speed Vert. Miller, 1942
American 4' Enc. Head Radial Drill 12" col.
Dill 18" Str. A.C. M.D. Vert. Slotter adj. head
G & L and Universal 3" Bar Horiz. Boring Mills
20" All Grd. Camel Back Drill
Cin-Bick 3' & Morris 3½' Arm Radial Drills
Blanchard M.D. Vert. Sp. Surface Grinder 26" chuck
L & S 20" x 8', 18" x 21', 20" x 10', 28" x 12'
Monarch 20" x 8', Amer. 20" x 12' grd. hd. q.c.g. m.d. Engine Lathes
B & S Nos. 2-B & 3-B, Cin No. 3 Mill, No. 2-B & 3-B, Cin. No. 5 LoBlond No. 4, Grd. Hd. Plain Millers
B & S No. 2-A & 3-A, Mill, No. 2-B, Cin. No. 1-M, Cin. No. 2 Grd. Hd. Univ. Millers
Campbell No. 213 abrasive cut off.
Brake D & K Leaf type Power 10' Length ⅜" Capacity
Bullard 24" & 36" Vert. Turret Lathes
Lynd-Farquhar 26" stroke openside Shaper Planer
Le-Swing R-14 late production Lathe
K&T No. 2K Universal Miller
Avey 2-Spindle MA6 Drill Press late.
Cin. 24" M.D. Univ. Shaper.
Cleveland 48" x 12' Table Openside Planer, 3 Hds.

MONA MACHINE TOOLS

McDONALD MACHINERY CO.
1531-35 No. B'way., St. Louis 6, Mo.

No. 2 L & G 2-spin. Drill, P.F., belt.
B & S Auto. Magazine Feeds, M.D.
No. 2 Press-Rite Presses, dial feeds, 1947.
Putnam 18" H.D. Slotter, M.D.

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12'x¼" DREIS & KRUMP. AC MOTOR DRIVE.

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QUICK CHANGE GEARED HEAD LATHE. HOUSTON-STANWOOD-GAMBLE. 42" SWING. (WILL SWING 50" WITH RISERS NOW ON MACHINE). x 30' CENTERS. AC MOTOR DRIVE.

VERY GOOD CONDITION

WINSTON MACHINERY COMPANY, INC.
517 S. Delaware St., Indianapolis 4, Indiana

GUARANTEED EQUIPMENT *IMMEDIATE DELIVERY*

BORING MILLS
Bullard 24", 36", 42" VTL. New Era
Cleveland 2½" Bar Cap.
Giddings & Lewis No. 0, 3" cap.
Giddings & Lewis No. 32, 3⅛" cap.
King 42" & 72" Vert. 2 rail heads
Lucas No. 31 Precision, 3" bar
Niles-Bement-Pond 4" Bar
Niles-Bement-Pont 4½" Bar
Niles-Bement-Pond 60" Vert.

DRILLS AND RADIALS
American 6'13", 5'11"
Buffalo #2 Motor Spindle
Defiance #112, 21" Production type
Fosdick #5 BM, #3 taper
Natco B2 24 spindle
Sibley 24" & 28"

ENGRAVERS
Gorton #1A 2 Dimensional
Gorton #3B 3 Dimensional

GEAR EQUIPMENT
Barber-Colman #12 Hobber (2)
Brown & Sharpe #13 Cutter
Fellows High Speed Shapers #7, 712, 72, 725
Flather 72" Cutter
Gleason 3" Straight Bevel Generator
Gleason 11" Bevel
Gleason #4 Angular Bevel Tester
Gleason #2 Surface Hardener
Gould & Eberhardt 36" Cutter, Univ.
National Broach Red Ring Lapper
Schuchardt & Schutte #1 Hobber

GRINDERS, MISCELLANEOUS
Brown & Sharpe #1, #3 Univ. #13 Tool
Cincinnati #2 Centerless
Cinn. 12 x 48" Univ.

Covel #91A Univ. Tool & Cutter, Hammond #4
Heald #81 Internal Gagematic
Heald 72A3 Int. Centerless Sizematic, #1 Tool
Landis 12"x36" Univ., Latest, #6 Thread
Landis 6" x 30" Type C Cyl.
Norton 6"x18", 6"x30" Type C cyl., 10x18"
Oliver #510 Drill Pointer, Sellers 4G, 6G, Black Diamond
Porter Cable Belt WGB, G8; Gramby Int.
Pratt & Whitney Radius #R6, K.O. Lee Tool

GRINDERS, SURFACE
Abrasive 3B 8x24", #33, #34 Vert.
Blanchard #16, 30" Mag. Chuck, B & S #2B Motor Spindle
G & L #25, 6" x 18"; #45, 12" x 24" Hyd. Feed
Heald 22—12" chuck, Arter 12"
Norton 6 x 18" Hyd., 10 x 36"
Pratt & Whitney 12 x 36" Vert.
Thompson Hyd. 6 x 10 x 18", 6 x 12 x 18"

LATHES
American 20" x 8' Bed G.H. Lathe
L & S #2A Duomatic, Like New, #3 Duomatics
Hardinge Precision 9", 1" Collet Cap., Rivett
Hendey 12 x 30" T.A., collets, etc.
Hendey 14" Yoke Head Lathes
LeBlond Regal 10" x 3' bed
Putnam 36" x 22'
Putnam 42" x 17'
Sebastian 12" x 4' G.H.
Wickes 32" x 35' Geared Head

MILLS, PLAIN, UNIVERSAL & PROD.
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Cincinnati #4, Univ. High Power
Kent Owens IV
Sundstrand 00 Rigidmil; Whitney Hand Mills

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Gorton, 8½D
Morey #12M Profiler, 2 sp.
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330 W. 42 St., N. Y. 18, N. Y.

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this Searchlight Section of

American Machinist

is an index of reliable sources for Used and Surplus Equipment Supplies now available. Consult the *Searchlight Section* in following issues for later offerings.

If you don't see what you want—ask for it. Ask the advertisers. They are constantly adding to their stocks and may have acquired just what you need. Or, shall we ask them for you?

And, when you have special items to dispose of, use the Searchlight Section of American Machinist to help you locate buyers. . . . Send a list of your equipment and we will gladly give information as to space and rates.

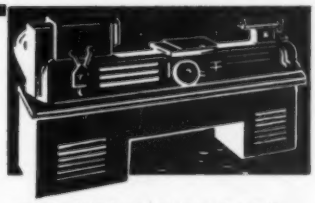
Classified Advertising Division

American Machinist
330 W. 42nd St., New York 18, N. Y.

For Dependable Used Machine Tools In A National Emergency—

You can rely on Motch and Merryweather

During the uncertain days ahead there is one thing you can be sure of—that is the universal high quality of Motch and Merryweather used machine tools. Our long experience in buying and selling machine tools—careful selection of the machines we buy—and the modern, complete facilities we have for reconditioning and rebuilding machinery, has built a constantly growing confidence in Motch and Merryweather used machine tools. For a better buy you better buy Motch and Merryweather.



BORING MACHINES

42" King Vertical Boring Mill
14' Niles Tool Works Boring Mill

DRILLS

D-31 Fox Adjustable Multiple Spindle Drill
#BL-2 Natco Multiple Spindle Drill
Kingsbury Model "B" 2-Spindle Drill
#2-KH 6-Spindle Allen Drill Press

GEAR CUTTERS AND HOBBERS

#18-H Gould & Eberhardt Hobber
#725 Fellows Gear Shaper
#135 Cleveland Axle Shaft Hobber
36 BM 3-Spindle Gould & Eberhardt Gear Cutter

GRINDERS, CYLINDRICAL

6"x18" Norton Type C Plain Cylindrical Grinder
6"x18" Model "ER" Cincinnati Plain Cylindrical Grinder
6"x30" Model "EA" Cincinnati Plain Cylindrical Grinder
10"x36" Model "EA" Cincinnati Plain Cylindrical Grinder

GRINDERS, INTERNAL

#16-16 Bryant Internal Hydraulic Hole Grinder
#16-28 Bryant Internal Hydraulic Hole Grinder
#72A3 Heald Plain Internal Hydraulic Grinder
#72A5 Heald Extended Bridge Internal Grinder

GRINDERS, SURFACE

Model "B" Pratt & Whitney Surface Grinder
#34 Abrasive Surface Grinder
#22 Heald Rotary Surface Grinder

GRINDERS, UNIVERSAL

#1 Norton Tool and Cutter Grinder
#3 Brown & Sharpe Universal Grinder

LATHES

14"x30" Sidney Engine Lathe
Bridgeford 28" Swing x 30' Bed Geared Head Lathe

MISCELLANEOUS

#2 Cincinnati Centerless Grinder
15-Ton Lucas Forcing Press
36" American "Heavy Pattern" Universal Shaper
#214 Besly Disc Grinder
#5 Cincinnati High Power Plain Mill

MOTCH AND MERRYWEATHER MACHINERY CO
CLEVELAND DETROIT
CINCINNATI PITTSBURGH

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USED MACHINE DIVISION

1350 EAST 222ND STREET
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UNUSUAL VALUES

Milling Machines—No. 1 Universal. No. 1 American (new) plain. No. 1 Vertical.

Drills—Large selection, single and multiple spindles also bench types, many of them new.

Gear Cutters—Brown & Sharpe No. 8—26" Gould & Eberhardt 42".

Grinders—Cylindrical B & S No. 11. Planer type 16"x36" Surface 18"x42", also new (small) Universal bench and floor type. All with coolant, motorized.

Lathes—14"x6', 8', 10'—16"x8', 3', 10'—18"x6', 8' 10'—26"x16'—all cone drive, several motorized also (new) 18"x8' and 10' geared head, motorized. Large stock 19" and 18" bench and floor type.

Planers—Single head 24"x6', 24"x8', 36"x8'.

Shapers—16", 20", 24" B.O. crank.

Turret Lathes—J & L, 2"x24"—3"x36" also Acme, W & S Turret (vertical) boring and facing mills, 8 hole turrets, 30", 49".

SPECIAL—Now totally enclosed dust proof, fan cooled ball bearing saw arbor motors, plain shafts to size or threaded, and with collars, measures only 3¼" from center of shaft to flatted top (1 h.p. to 15 h.p.) 3 or 8 phase, 3600 r.p.m.

WOOD WORKING MACHINERY—A very large stock of new and re-built, practically all motorized. New Motorized overhead cut-off and miter saw for wood, plastics, steel, aluminum and other metals. The above list is only a fraction of our stock which changes almost daily, therefore, tell us definitely what you want since we are adding considerable number of machines to our stock which are too many to list. What we have today may be sold tomorrow, as a list is really not dependable.

Drill—Foote-Burt No. 25 24" Hi Duty 2" capacity in steel. Motor attached.

PATTERN MAKING MACHINERY—42"x16' bed wood lathe, compound rest, rack and pinion feed to carriage; 16" heavy duty jointer, extra long bed, front table tilts for giving draft to pattern work; tilting table also tilting arbor rip and cut-off saws; band saws; jointer; floor and bench type trimmers; and also many other machines for pattern work.

THE OSBORNE & SEXTON MACHINERY CO.
P. O. Box 88 Columbus 16, Ohio

LATE MODEL MACHINE TOOLS . .

AUTOMATICS

20"x25" Fay Automatic. 1942.

DRILLS

4'11" Canedy Otte Radial.
No. 2 LMS Leland Gifford Hyd. 1942.

GEAR EQUIPMENT

No. 645A3 & 615A Follows Gear Shaper. 1944.
No. 6 Gleason Rovacycle. 1940.
No. 6 Gleason Gear Tester. 1942.
9" Red Ring Internal Shaver. 1942.
13" Red Ring Lapper. 1942.
Red Ring Universal Tester. 1942.

GRINDERS, CYLINDRICAL

14"x168" Norton Plain Type C. 1942.
14"x48" Norton Pl. Type C. Hyd. 1941.
14"x36" Landis Univ. Type C. Hd. 1942.
10"x36" Cincinnati Plain Hd. 1942.
6"x18" No. 10 Brown & Sharpe Pl. Hyd. 1943.

GRINDERS—INTERNAL

No. 24-36 Bryant Hyd. 1943.
No. 172 Heald Hyd. Gap. 1940.
No. 81 Heald Plain Hyd. 1940.
No. 73 Heald Airplane Cyl. 1942.
No. 50 Heald Hyd. 1943.

GRINDERS—THREAD

No. 33L Excello Precision. 1943.
No. TG-615 Jones & Lamson. 1942.
No. 2 Dalzon. 1942.

GUN BARREL MACHINES

No. 410 Barnes Deep Hole Drill. 1943.
No. ½B x 50 P&W Reamer. 1942.
No. ½B x 50 P&W Reamer. 1942.
No. ½B x 50 P&W Rifler. 1942.

LATHES—ENGINE

30"x300" American G.H.
20"x240" LeBlond. 1941.

LATHES—PRODUCTION

No. 3 FU Foster "Fastermatic". 1942.
14"x42" Monarch "Magnamatic". 1941.
8"x100" La-Swing Semi. Auto. 1942.
No. 4D Potter & Johnson. 1942.

LATHES, TURRET

9¼"x24" Acme Univ. 1943.
No. 5.0 Acme Univ. 1942.
No. 1M-5 Libby Univ. 1942.
No. 6R Denver Univ. 1942.
No. 3 Bardons & Oliver. 1940.

MILLS, PRODUCTION

No. 34-36 Cincinnati Hydro. 1942.
No. 5-48 Cincinnati Hydromatic. 1942.
No. 1-18 Cincinnati. 1942.
No. 1-14 Kent Owens Hyd. 1942.
No. 0B Plain & R & F Cin. 1941.
No. 2 Sundstrand "Electromil". Late.

MILLS, THREAD

6"x36" LT Loss Bradner. 1942.

MISCELLANEOUS

48"x½" Niles Plate Straightener.
No. 616 Cleveland Rigidturner. 1942.

PRESSES

50 Ton Denison Straightening. 1942.

SHAPERS

24" Rockford H.D. Hyd. Latest.
20" Cincinnati Pl. Latest.
16" American Pl. Latest.
6" Pratt & Whitney Vertical. 1942.

WELDERS

100 KVA Taylor-Winfield Semm. 1943.
60 KVA Selsky Spot. Like New.

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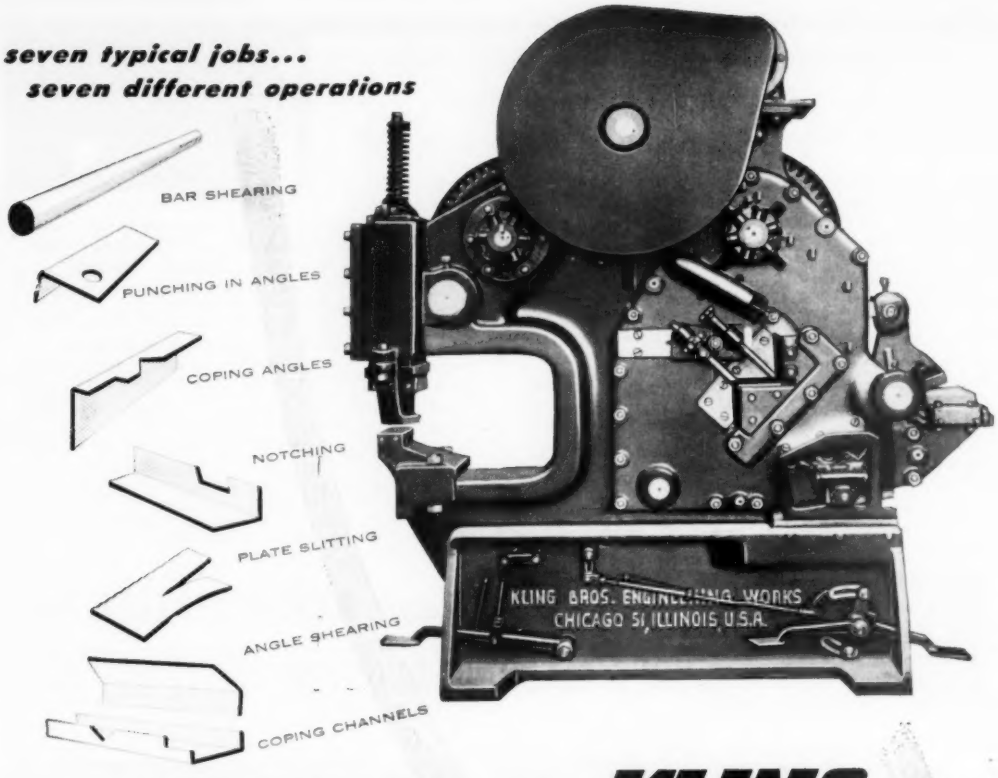
1961 S. Meridian St. • • Indianapolis, Indiana

seven typical jobs...
seven different operations



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COMBINATION SHEAR, PUNCH AND COPER

Here are just seven of the many operations performed in one typical shop on *one* Kling combination Shear, Punch and Coper. If you do heavy metal fabricating work...volume production or an occasional maintenance job...you'll find many other ways this machine can save you money.

For example, *one* Kling Machine in your shop can turn out the work of a separate punch, angle shear, bar shear, plate shear, or notcher. And you get all this multiple machine production for only a few dollars more than the cost of a single-purpose punch.

The Kling Combination is a rugged, heavy-duty machine built to machine tool precision. Each end operates independent of the other for faster, safer operation. Foot pedals allow both operators to keep both hands free to hold work. Available in 3 sizes for light, medium or heavy work.

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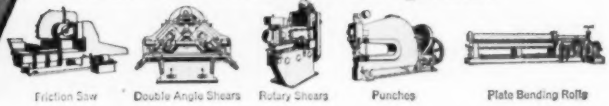

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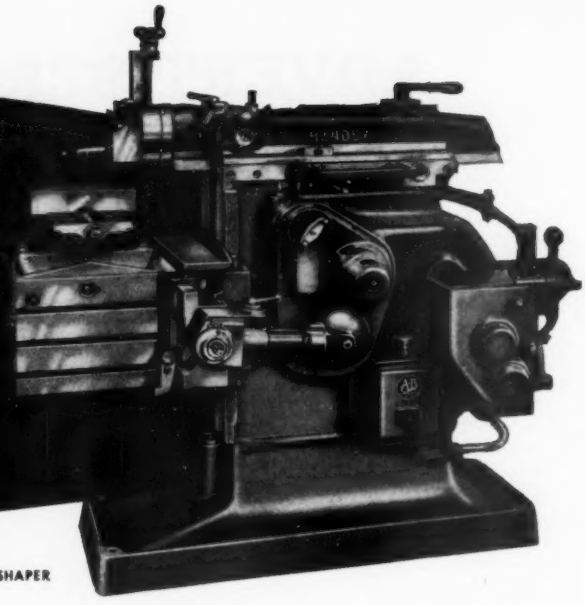
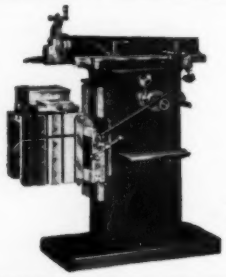
...If you are not using Modern Hendey Machines you are not earning the profits that you should!



1950
12" UNIVERSAL CRANK SHAPER

A comparison of the old Hendey Friction Shaper with the NEW Hendey 12" Universal Crank Shaper will instantly reveal the profit possibilities that you may be missing. The modern Hendey Shaper offers the most complete, up-to-date shaper available today. Full standard equipment means that there are no "extras" to buy. This equipment *includes* table and vise for positioning and indexing work to any angle—flanged mounted motor—mechanical controls *on both sides*—fully automatic lubrication—quick change swivel head—adjustable, preloaded Timken bearings on the bull gear. The 12" Hendey covers a range which makes it ideal for tool room and production work. Hendey Shapers are also available with capacities from 16" to 28", both standard and heavy duty. Write for full details on the modern Hendey Shapers.



1920

Still using old 15" Hendey friction drive shapers? They have only 2 speeds, 21 and 30½ strokes per min., as against 8 speeds from 14—200 for the new 12" shaper. Surveys prove that the new 12" Universal High Speed Crank Shaper covers a majority of all jobs in most plants. Mechanical changes are almost too numerous to mention—improved accuracy, speed and profits on the new 12" shaper will easily convince you of the advisability of changing *now*!

Continuous, advanced engineering by Hendey is worth watching—and must be watched if you are to earn full profits from your lathes and shapers. For complete particulars and prices, contact your nearest Hendey office.

MODERN Hendey

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for increasing productive efficiency

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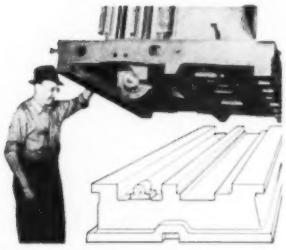

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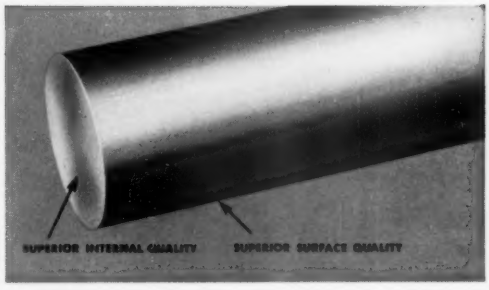

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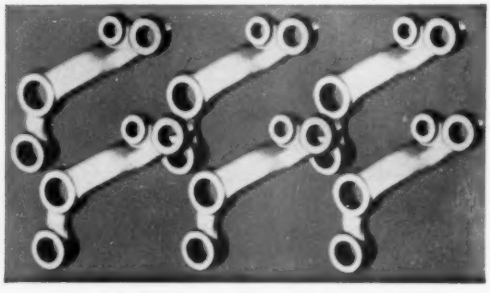

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